

Exploring Access to Primary Healthcare among
Diabetic Patients in Oman

Deena Al Asfoor

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Nuffield Department of Population Health

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Deena Al Asfoor

St. Catherine College & Nuffield Department of Population Health, University of

Oxford

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Abstract

Access is an essential and yet only vaguely understood component of Universal Health Coverage. In this thesis, my aim is to measure patients' experiences of access to healthcare in Oman and to understand how this access is associated with disease outcome and quality of life.

Initially, I carried out a concept analysis of access to primary healthcare, in which I identified the attributes, antecedents and consequences of access, and then utilised these attributes to map items for a patient experience questionnaire, using existing tools. This questionnaire, which I named Access-31, was subsequently tested for face and content validity through focus groups and individual interviews before it was utilised to conduct a survey of diabetes-2 patients attending primary healthcare services in Oman. The survey involved the use of Access-31, a quality of life measure, glycated haemoglobin data (HbA1c) and socio-economic indicators for study participants.

The domains of access are as follows: geographical access, access to information, organisational access, affordability, cultural acceptability and availability of services and medicines. The cross-sectional survey showed that 28.3% of the respondents reported having had at least one problem related to geographical access, while 83.2%, 61.2%, 4.9%, 35.7% and 47.8% respectively experienced at least one problem with access to information,

organisational access, affordability, cultural acceptability and availability of services and medicines. The composite access score indicated that 6.0% of the participants reported no problems with access, 38.4% 1-3 problems, 39.6% 4-6 problems, and 15.9% more than six problems. Geographical access, organisational access, cultural acceptability and overall access were associated with self-reported quality of life (P -value <0.01), and the odds ratio for the relationship between availability of services and medicines and HbA1c was 3.02 (P -value <0.01), while for access overall this figure was 2.56 (P -value $=0.01$).

Access-31 is a promising tool that would appear to reward further testing as regards the measurement of accessibility in healthcare. Poor access to healthcare is associated with poor health outcomes, and policymakers in Oman are advised to investigate variations among governorates and to take appropriate action.

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Glossary:

ACSC	Ambulatory care sensitive conditions
ADS	Appraisal of diabetes scale
BCQ	Barrier to care questionnaire
CAHPS	Consumer assessment health plan study
CINAHL	Cumulative Index to Nursing and Allied Health Literature
CKD	Chronic kidney disease
DCP	Diabetes Care Profile
DDS	Diabetes Distress Scale
DHP-18	Diabetes health profile
DOQ-2007	Diabetes obstacle questionnaire
DSC-Revised	Diabetes symptoms checklist - Revised
EMR	Electronic medical records
EPF	European Patients' Forum
Europep instrument	An instrument for measuring patient evaluation of general practice care
FG	Focus group
GP	General practitioner
GPAS	General Practice Assessment Survey
HAQ	Health Access and Quality Index
HbA1c	Glycated haemoglobin
HCQ	Healthcare questionnaire
HRQOL	Health-related quality of life
ID	Identification number
MeSH	Medical subject heading search

MSc	Masters in Science
NCSI	National Centre of Statistics and Information
OR	Odds ratio
OxTREC	Oxford Tropical Research Ethics Committee
P	Participant
PAID	Problem areas in diabetes
PCAS	Primary card assessment survey
PCAT	Primary care assessment tool
PHC	Primary healthcare
PROMS	Patient-reported outcome measures
PubMed	(https://www.ncbi.nlm.nih.gov/pubmed/)
QA	Quality assurance
QUALICOPC	Quality and cost of primary care in Europe
SDG's	Sustainable development goals
SPSS	Statistical Package for Social Sciences
TPSA	Infosec third party security agreement
UHC	Universal health coverage
UN	United Nations
UNICEF	United Nations Children's Fund
US	United States of America
WHO	World Health Organization

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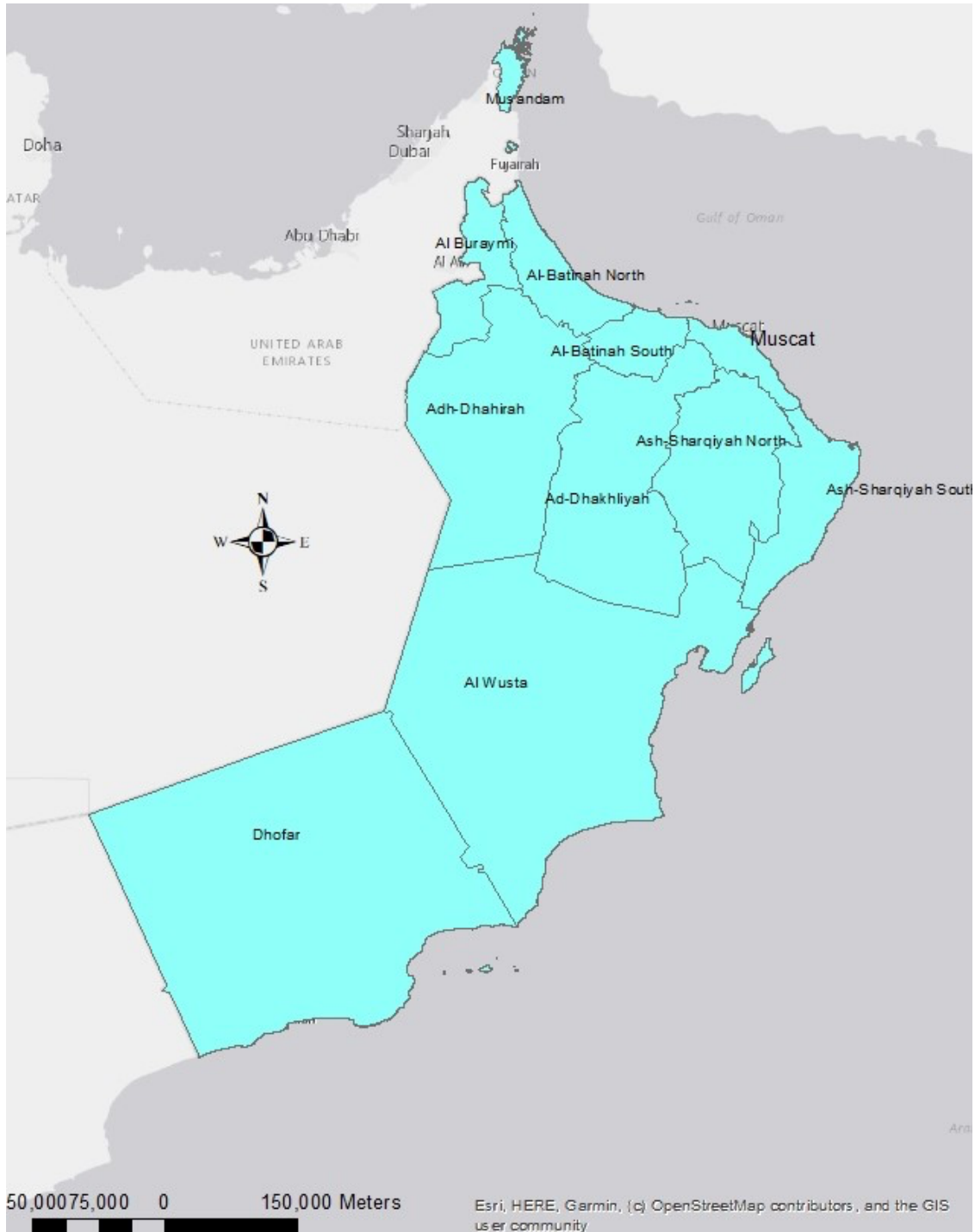
Chapter 1. Introduction

1.1. Background on Oman

Oman is a Middle Eastern country situated in the south-eastern corner of the Arabian Peninsula. Blessed with diverse terrain and a long coastline, it also has a small population of about 4.5 million. According to the National Centre of Statistics and Information (NCSI), however, the population is increasing rapidly. As shown in Figure 1, Oman is composed of 11 administrative regions. Government services are decentralised, and well-maintained roads connect the mountainous areas to the coast and to the capital, Muscat (Figure 1).

NCSI reports that 43% of residents are non-Omani, many of whom work in construction, building new national development and industrial projects. The majority of expatriates in Oman are between the ages of 20 and 59 (National Center of Statistics and Information, 2018). Between 2000 and 2017, the Omani population increased from 1.78 to 2.51 million, representing 41% of the total population of 4.5 million, and the percentage of people living in urban areas also increased slightly, from 71.6% to 78% (National Center of Statistics and Information, 2018; The World Bank, 2018)

Figure 1 Administrative governorates of Oman¹



¹ Map data courtesy of the Ministry of Health, map created on ArcMap.

1.2. Background on the health system in Oman

The health system in Oman is composed of a network of primary healthcare centres, secondary healthcare facilities and hospitals spread all over the country (Department of Health Information and Statistics, 2019).

Diabetes has been recognised as a public health problem in Oman since 1991. The first national diabetes survey of that year showed that the age-adjusted prevalence of the disease was 13.5% (Asfour *et al.*, 1995; Al-Lawati *et al.*, 2015). Following that survey, a national programme and diabetes register were established for early screening, management, and surveillance. This register is updated at all primary healthcare facilities and monitored frequently by programme managers in each governorate, as well as being audited by the central programme manager in Muscat. A National Center of Diabetes was set up at the Royal Hospital in Muscat, and this was promptly recognised as a WHO collaborating centre. All diabetes programme activities are managed by a central national committee which oversees the planning and implementation of non-communicable disease programmes (Hill A *et al.*, 2000).

The rate of diabetes fell to 8.5% in 2008, possibly because of the extensive prevention and management efforts made by the Ministry of Health (Morgan *et al.*, 2019). Despite this improvement, though, there are concerns regarding a lack of human resources, especially related to specialised nursing, the ambiguity of the roles and responsibilities of various team members, and unclear leadership at primary care level. Awareness of national treatment protocols was also found to vary among staff members (Al-Alawi *et al.*, 2019).

Complications resulting from diabetes are higher in Oman than in other neighbouring countries. For example, more than 14% of diabetics were found to have retinopathies, and 27% microalbuminuria, whereas more than 50% of amputations in 2005 were attributed to diabetes (Al-Shookri *et al.*, 2011).

Some of the major obstacles facing appropriate management of diabetes in Oman include health system organisation, human resources and financial resources, availability of drugs and supplies, treatment protocols and laboratory support (Alyaarubi, 2011).

The mini-review above examined diabetes management and control from a system perspective. To the best of my knowledge, there are currently no studies investigating the experience of individuals living with diabetes in Oman, and this study will aim to address this gap.

1.3. Rationale of the study

The World Health Organization defines universal health coverage (UHC) as “*access to key promotive, preventive, curative and rehabilitative health interventions for all at an affordable cost, thereby achieving equity in access*”. In testimony to its importance, UHC was endorsed by Ministers of Health as part of the United Nations (UN) Sustainable Development Goals (SDG’s) in 2005, and by world leaders in 2015. Item 3.8 of the SDGs states that UHC preserves “*financial risk protection, access to quality essential healthcare services as well as access to safe, effective, quality and affordable essential medicines and vaccines*”. It is argued that UHC encompasses all the requirements of a functional healthcare system, though specific measurement criteria and indicators are yet to be agreed upon (World Health Organization, 2005, 2015).

As per the United Nations treaties, health is a basic human right and UHC is a social contract that ensures accessible healthcare for all while maintaining financial protection. Access to primary healthcare has been measured using many methods, often inconsistent. The UN, for example, claims that access to healthcare is composed of four overlapping dimensions: non-discrimination, physical accessibility, economic accessibility, and accessibility of information. On the other hand, a systematic review investigating access to

primary healthcare (PHC) tools and measurements found that seven attributes were used as proxies to access. In this review, which included 266 studies, the most measured attributes were found to be: “organizational access 60%, physical access 29%, financial access 20%, utilization 20%, access to information 3%, equity and relevance 6%” (U.N. Committee on Economic Social and Cultural Rights, 2000; Al Asfoor, 2015; The United Nations, 2012; Ji and Chen, 2016).

As no single measurement was available regarding access to primary healthcare, the aim of this study was to develop a multi-dimensional patient reported experience measure, in order to fill this void in the literature. In this study I shall use the tool that I myself developed in the fulfilment of MSc requirements in Evidence-based Healthcare at the University of Oxford in 2015. This tool is made up of 29 questions spread over six domains and was therefore named Access-29 (Holt and Alasfoor, 2015).

The literature on access to primary healthcare in Oman is scarce. One study indicated that only 59.3% of hospital patients were satisfied with the distance they had to travel to reach health facilities, and Al-Azri *et al.* (2016) reported that there was an association between proximity to primary healthcare services, seeking healthcare and attending health education sessions. On the other hand, 98.3% of Omanis and 70.3% of expatriates were covered by health insurance in 2008 (Department of Health Information and Statistics, 2017; National Center for Statistics and Information, 2013-2014; Al-Riyami *et al.*, 2008; Al-Mandhari *et al.*, 2008).

Questionnaires, particularly those containing evaluative and reporting components such as patient experience questionnaires, are a common research method in the field of health, and they can produce information which is meaningful for policy change. Questionnaire development is a complex, multi-stage process. For a questionnaire to produce valid results, it is important that it maintains semantic and conceptual equivalence, and when

the questionnaire is translated into a different language, it should be ensured that it is both culturally sensitive and comprehensible (Song *et al.*, 2015; Beaton *et al.*, 2000).

Patient and public involvement has an important role in health and social research. It has been found to favour the production of high-quality, patient-relevant research and culturally appropriate research information and study instruments. It is customary to conduct focus groups involving the target population in order to inform the development of patient experience questionnaires, and to complement this with cognitive interviews that will validate the research and encourage comprehension and content coverage within the target population. Cognitive interviews allow the researcher to understand the questionnaire from the respondent's point of view, and this is especially valuable for new concepts or tools (Brett *et al.*, 2014; Rothman *et al.*, 2009; Green and Thorogood, 2014; Drennan, 2003).

In this DPhil thesis, my aim is to develop and test a measure for access to primary healthcare and to apply it to a cross-sectional survey of diabetic patients in Oman. The tool used to measure access, which was developed in the course of my fulfilment of my MSc, will be further refined and used in a cross-sectional study. The detailed methods used in the development of the tool will be set out in several stages, as explained below. For the cross-sectional study, I intend to use demographic questions, the aforementioned access to primary healthcare tool and an HRQOL instrument. I will also measure the associations between access to primary care, diabetes outcome and quality of life (Holt and Alasfoor, 2015; Khader *et al.*, 2008).

1.4. Objectives of the study

In order to fulfil the overall objective of testing the questionnaire on access to primary healthcare and applying it to a sample of diabetic patients in Oman. I planned implementation in a number of stages. To begin, concept analysis will aim to understand the concept of

“access to primary healthcare” from the perspective of researchers, using Rodgers’ evolutionary method to analyse the concept across time.

The aim of the qualitative component is to generate a culturally sensitive instrument with acceptable face and content validity, which will then be used to measure access to primary healthcare and quality of life among Type 2 diabetic patients in Oman. In the cross-sectional study I plan to use the aforementioned instrument to assess quantitatively access to primary healthcare, quality of life and glycated haemoglobin levels in a random sample of patients receiving primary healthcare in Oman. I will also use regression methods to determine whether access to primary healthcare is associated with quality of life or glycated haemoglobin levels, and will also examine the association between glycated haemoglobin and quality of life.

Chapter 2. Review of the literature

2.1. Concept analysis of “Access to Primary Healthcare”

2.1.1. Background and rationale for the methodology

According to the literature, there are several ways to understand and analyse a given concept. One approach focuses on the link between the concept and the empirical world, while another views it as a label for a mental image, and some other scholars posit that personal interaction (i.e. language) plays a significant role in building a concept (Rodgers and Knafl, 2000). Concepts may be hazy, inconsistent and difficult to interpret pragmatically (Solonchak and Pesina, 2015), though a clearly defined concept is a prerequisite for its use in research use and is considered to be the foundation of scientific knowledge (Botes, 2002).

The choice of concept development methodology should be driven by the concept itself. Beecher et al. (2019) classified three concept analysis methods, namely concept analysis, concept clarification and concept explorations. If the concept of interest has already been explained, refined, and validated earlier, Beecher *et al.* (2019) recommended concept analysis as the method of choice. Concept clarification, meanwhile, as the name suggests clarifies ambiguous concepts, and concept exploration is best used for new concepts (Botes, 2002; Beecher *et al.*, 2019). The literature on access to primary healthcare is a rich one, with more than 10,000 articles on the subject in PubMed between 1974 and 2018, including several manuscripts on concept analysis, qualitative and quantitative surveys, and tools development and validation. Bearing this in mind, for this study the choice was made to adopt concept analysis methodology.

Scholars including Wilson (1970), Rodgers (1989), Penrod and Hupcey (2005) and Walker and Avant (2011) have proposed different methods of concept analysis. Wilson’s

method had been criticised for being too simplistic and primitive, and all concept analysis methods except for that of Rodgers follow a reductionist positivist paradigm and assume an objective truth, and as such these methods do not allow for alternative or complex interpretations. (Rodgers, 2000) stipulates that concepts are defined by their characteristics which are mentally formed and highly contextual. The words used to describe a concept can categorize and clarify situations and it is common to articulate a concept in a variety of ways, which leaves much room for discrepancy and confusion. In the case of access to primary healthcare, using access, accessibility and utilisation is a prime example of that. Access to primary healthcare may be viewed as an evolving concept, and since the 1970s a plethora of research and frameworks has been published (Ricketts and Goldsmith, 2005). Taking this into consideration, I chose Rodgers' method for this analysis, given that in my view the concept of access primary healthcare changes according to context and perspective.

After an exploration of the literature, I found that primary healthcare, healthcare and medical care were used interchangeably. In some cases, avoidable hospitalisation has been used as a proxy for access to primary healthcare, and in other cases survey data on primary health experience was collected from patients attending secondary care facilities.

When searching in PubMed for “access to primary healthcare”, it was not possible to find this term in the MeSH database, and the search therefore retrieved all records on access, accessibility and healthcare instead. For these reasons, the analysis contains access to all levels of healthcare, including primary, secondary and tertiary care.

2.1.2. Choosing the concept and context: “Access to Primary Healthcare”

In October 2018, health experts and world leaders gathered in Astana (Kazakhstan) to commemorate 40 years since the Alma Ata Declaration, and to reinforce the role of primary healthcare in achieving the best attainable standard of health for citizens of the world (World Health Organization and United Nations, 2018). The Astana declaration confirmed the

commitment of WHO member states to Universal Health Coverage (UHC) and Sustainable Development Goals (SDGs). The Declaration also stated that:

“We (member states), will each pursue our paths to achieving UHC so that all people have equitable access to the quality and effective healthcare they need, ensuring that the use of these services does not expose them to financial hardship”.

In order to achieve UHC programme managers, policymakers and researchers should be able to understand and measure each of its individual components, namely access, quality care and financial protection. Here, my focus is on access to healthcare, and this chapter presents the concept analysis. In the following chapter, I shall present results of a qualitative study measuring patient interpretations and experience of access in Oman.

2.1.3. Review methodology

In this review, I have followed the seven steps suggested by Rodgers (1989) to conduct evolutionary concept analysis:

1. Identify the name and concept of interest;
2. Identify the surrogate terms and relevant uses of the concept;
3. Identify and select an appropriate realm for data collection;
4. Identify the attributes of the concept;
5. Identify the references, antecedents, and consequences;
6. Identify concepts related to the concept of interest;
7. Identify a model case for the concept.

Previously I discussed the background for selection of the concept, and in the following sections I shall present data collection procedures, surrogate terms and relevant uses of the concept, the various approaches for understanding access in the literature, and then the definitions and frameworks of the concepts. Sections 2.1.6 and 2.1.7 will provide insight into how this concept has changed over time and the source of the concept

components. Finally, in Section 2.1.8 through 2.1.11, I shall present the attributes, antecedents, consequences and related concepts, as well as a model case as per Rodgers' method.

2.1.4. Data collection

To find relevant peer-reviewed articles and grey literature, I carried out an electronic search of the databases: PubMed, CINAHL and the search engine: Google, as well as the thesis database of the University of Oxford and the websites of the World Health Organization (WHO) and the United Nations Children's Fund (UNICEF).

In PubMed, I used the Medical Subject Heading [MeSH] term "access to healthcare" combined with the free text "primary healthcare" to search for articles up to 8 October 2018, with no start date limit. I also ran combinations of MeSH terms for synonyms of "assessment tool" and "primary healthcare". In CINAHL, I combined the search of the major subject heading "health services accessibility" with the subject heading "primary healthcare" (Appendix 1) using snowball retrieval of references to complete the search.

The PubMed search yielded 5,734 entries and the CINAHL search 4,516. In addition, I set a reminder on PubMed to identify new articles up to 1 January 2019, and compiled all such articles on an EndNote library. These articles were screened separately.

To obtain relevant manuscripts, I removed duplicate titles, and this yielded 7,874 manuscripts. Out of these, "access" or "accessibility" "primary care" did not appear in 7,092 titles or abstracts, and so these were eliminated. In addition, 39 manuscripts were removed because the full texts were not available. The remaining 743 manuscripts were screened, and it was found that 398 titles were not eligible because "access was not measured or defined" (n=322), "setting not PHC" (n=39), "language was not English" (n=20) and other reasons (n=17).

After the screening and elimination of duplicates and ineligible manuscripts, 384 entries were judged eligible for inclusion. Analysing all the articles indexed would be both prohibitively time-consuming and unrealistic in any systematic review, and therefore researchers advise reducing the number of articles. For this reason, a convenience sample is sometimes chosen, but Rodgers (2000) maintains that a representative sample should be drawn, suggesting that the sample should be distributed over time to ensure that a wide range of viewpoints are incorporated, with a view to improving the study's rigour and replicability. Following Tofthagen and Fagerstrom (2010), I used systematic random sampling, with a random selection of 20% of the 385 titles starting from a random number. To select a sample of manuscripts, the EndNote library was sorted according to publication date, selecting every fifth article. This yielded 77 articles spanning the entire timeframe of the review (1974-2018). I also chose to include 12 concept analyses and frameworks because these represent an important contribution to the understanding of access.

2.1.5. Surrogate terms and relevant uses of the concept

For concept analysis, it is important to decide what is of interest, and in what words the concept should be expressed, given that much confusion could arise if the same word has more than one meaning (Donnelly *et al.*, 2007). Rodgers (1989) advises beginning a concept analysis by identifying the surrogate terms and relevant uses of the concept. In this section, I shall explore some dictionary translations and interpretations and clarify the concept of interest.

The term "Access to primary healthcare" was not indexed in PubMed. The search was directed to the following terms: "Availability of health service", "Access to healthcare", "Accessibility of health services", "Geographic accessibility", "Program accessibility" and "Contraceptive accessibility". "Health services accessibility" was indexed under "Delivery

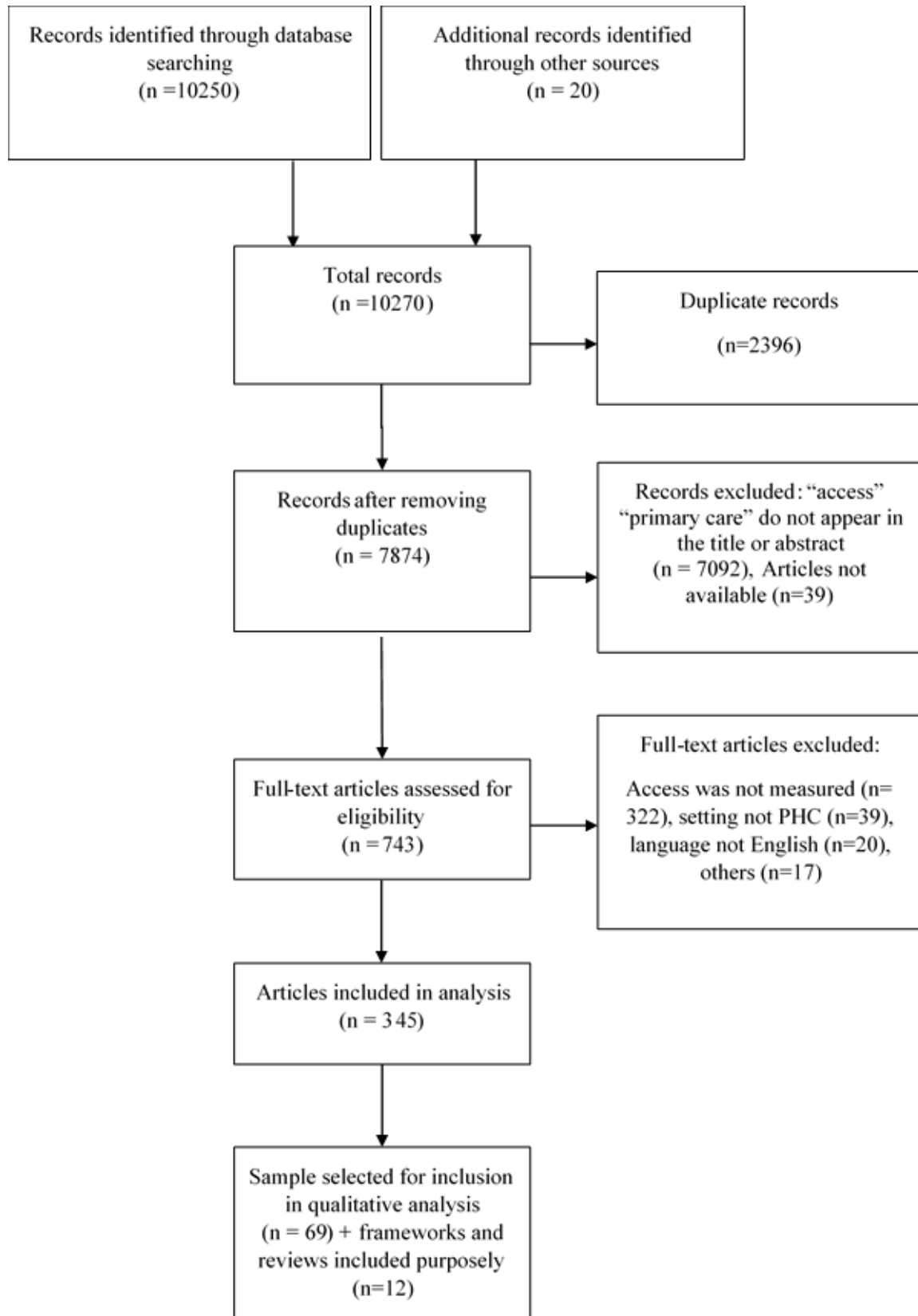
of healthcare”, and the terms branched out from it were “Health equity”, “Healthcare rationing”, and “Health facility closure” (U.S. National Library of Medicine, 2019).

Although “Access” and “Accessibility” are used interchangeably in the medical literature, the English dictionary translation differs. “Access” as a noun denotes entry, or opportunity to enter for an individual, while the verb “to access” means to enter. Access, or what Gulliford *et al.* (2002) called “gaining access”, is the “*initiation into the process of utilizing a service*”. Other surrogate terms for “access” in the literature are: spatial access, non-spatial access, realized access, contact accessibility, organisational access, and availability.

“Accessibility”, on the other hand, is interpreted as approachability, ease of access or availability (Oxford University Press, 2019). One could say that a health service is accessible, which means that it has features that allows a patient to benefit from it: Gulliford *et al.* (2002) defined “having access” as “*the potential to utilize the service if required*”. It is argued that “having access” and “accessibility” are one and the same.

This review will explore “Accessibility” in its meaning of “ease of access”, and will use “Access” and “Accessibility” interchangeably unless otherwise specified.

Figure 2 Prisma chart for the systematic review of the concept "Access to PHC".



2.1.6. Approaches to understanding access to healthcare

An understanding of the concept of access would not be complete without the exploration of earlier frameworks. Although Rodgers' framework does not include this step, it is my belief that it will help the reader, in two ways: firstly, to understand the source of the attributes described in later sections, and secondly to gain an insight into how accessibility as a concept has evolved over the years. In this section I shall preview approaches for understanding accessibility in chronological order, and in the following section I shall present some definitions.

- **Early frameworks (1974-2001)**

Early frameworks viewed access as a health system principle and part of an input-output equation. Aday and Andersen, for example, placed health policy at the top of their framework, suggesting that it acts as an umbrella for all the other components. The downwards arrows from the health policy text box to the characteristics of population and system indicate that health policy is the driving force, and that it has an impact that trickles down to utilisation, which, along with consumer satisfaction, enjoyed an equal position as outcomes (Figure 3) (Aday and Andersen, 1974).

Millman (1993) presented his model as a set of barriers that resulted in the use of service, and included appropriateness as a mediator. Again, for him access was on one side of an input-outcome equation. For Millman, appropriateness included efficacy and quality of treatment and patient adherence, each of which indicate a system perspective, with little emphasis on the user viewpoint.

Andersen's behaviour model (1995) took the same approach as Millman, while Gulliford *et al.* (2001) proposed a more complex model (not shown). The latter was nevertheless similar to the previous models, with very little emphasis placed on the patient. Satisfaction played no part, and individual characteristics such as health-seeking behaviour

and earlier experiences appeared as “barriers” before the demand for formal care, implying that once this demand existed those issues were no longer relevant. All the aforementioned frameworks considered access to be a product of health policy and health system behaviour, with some intervening variables of population characteristics.

- **Post-2001 frameworks**

Norris and Aiken (2006) placed access at the centre of their conceptual framework, with the antecedent being perceived need, and the attributes being availability, eligibility, amenability and compatibility. They defined amenability as the willingness of the consumer to use the service, and compatibility as the cultural fit of the service. Norris and Aiken’s placed greater emphasis on the patient experience rather than satisfaction, and this was even more pronounced in the model of Levesque *et al.* (2013), which took the user’s abilities as a main ingredient and included approachability and acceptability as domains of access.

Campbell and Salisbury (2015) proposed an overview of access to primary care that considered availability, accessibility, acceptability and affordability as experiences and expectations (of the consumer). The arrows feeding out and into this box show that they considered access to be the result of two-way interaction between the healthcare provider and the user (Figure 4).

This analysis reveals that between the 1970s and the 2000s access was perceived as a feature of the health system. The literature during this period discussed this concept from the viewpoint of health system policy, structure, resources, and organisation. After this, the view of access began to be centred on patients, emphasising their demand, needs and expectations.

Figure 3 Earlier frameworks of access. A: Aday and Anderson (1974), B: Millman (1993), c: Andersen's behaviour model (1995).

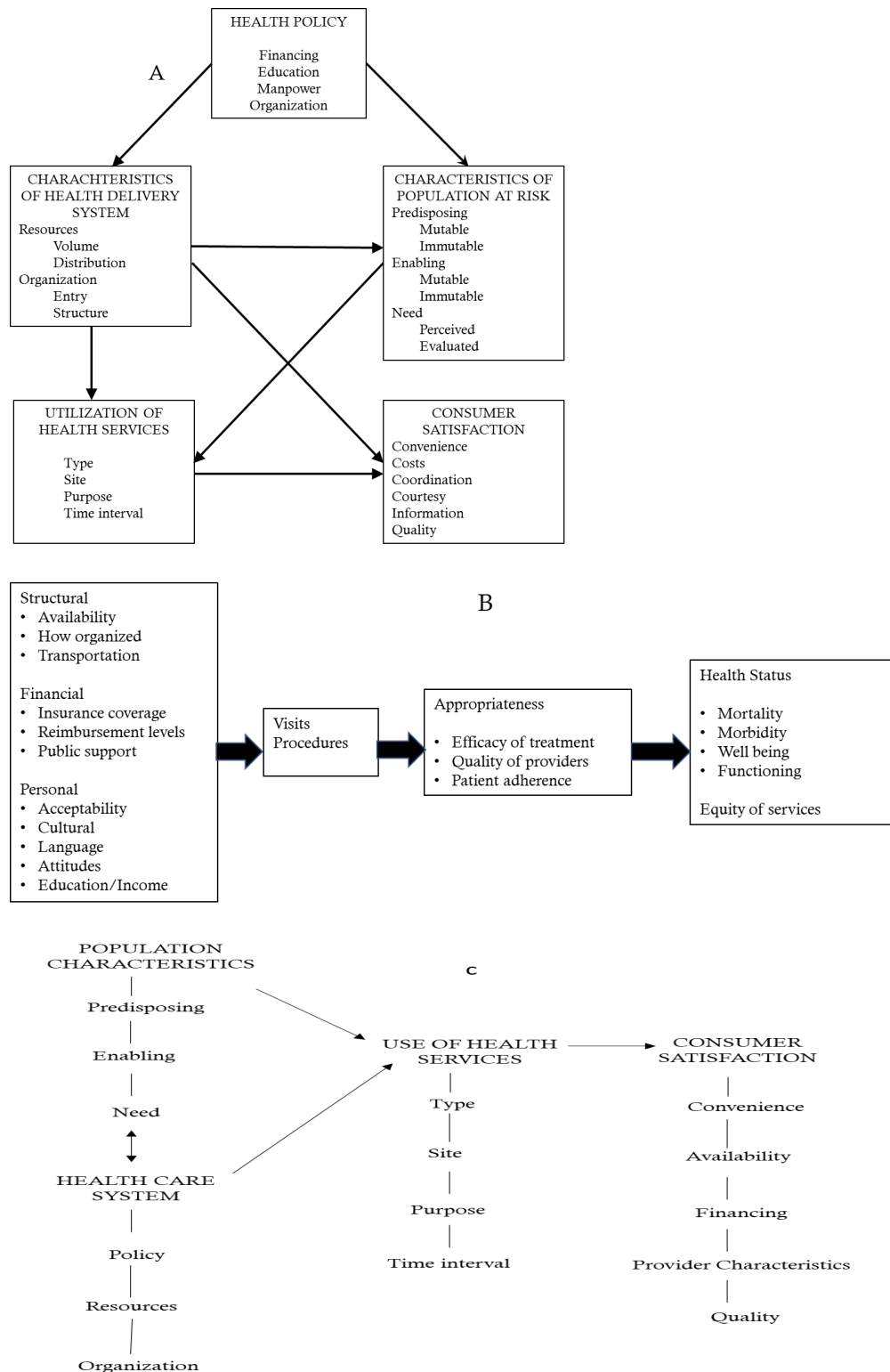
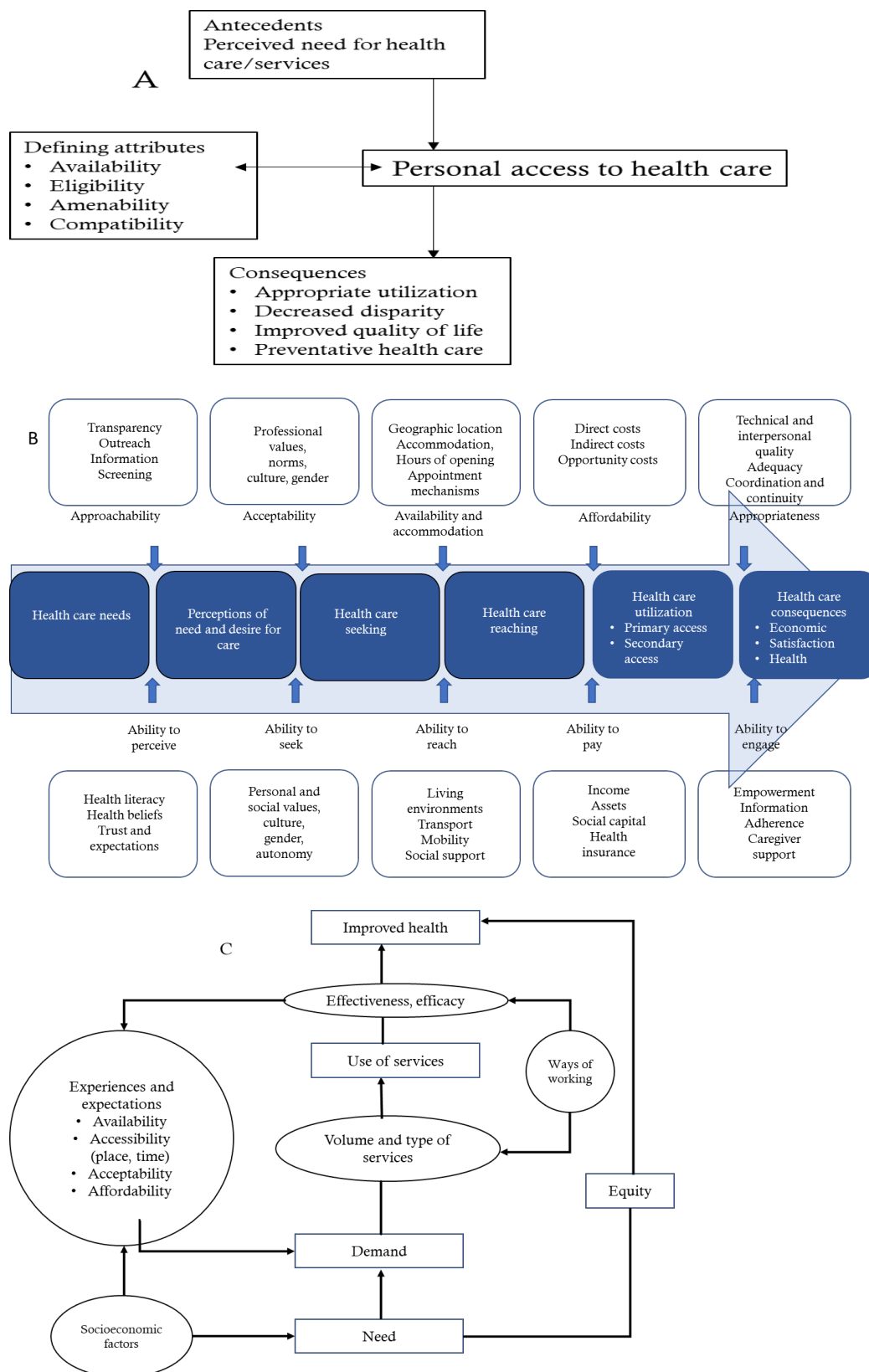


Figure 4 Post 2001 frameworks for access. A: Norris and Aiken (2006), B: Levesque et al. (2013), C: Campbell and Salisbury (2015).



Wording for these same attributes has also changed over time. For example, for Aday and Andersen (1974) cost was a minor item under satisfaction, while Campbell and Salisbury (2015) used the term affordability instead of cost, and affordability was considered as an attribute in itself. This might be interpreted in the light of the changing perspective of health research, which has in recent years focused more on the patient. Earlier frameworks did not consider the consumer's ability to pay, while in the later ones affordability measures to a certain extent the patient's ability to pay for the service rather than its specific price.

2.1.7. Definitions of "access to healthcare"

In this section, I shall present a chronological review of definitions of "access to healthcare", aiming to demonstrate the complexity and inconsistency of how access was and still is defined, and to draw attention to the origins of attributes that I shall go on to discuss in the next section.

Rashi Fein published the first peer-reviewed discussion of the relationship between access and equity in 1972, with a reprint appearing in the same journal in 2005. Fein believed that equity in access was determined by financial and delivery system factors, and he approached these two areas from a capitalist macro-economic viewpoint. He discussed, for example, the politics of health system financing and the influence of market labour forces on areas like health service supply. He did not offer a definition for access, but did suggest that restructuring the health system would improve equity in access (Fein, 2005).

Freeborn and Greenlick (1973) were the first to suggest a definition of access, considering it as a component of technical efficiency (quality). Aday and Andersen (1974) saw access as a political construct and the result of the inter-relationship between the characteristics of the health delivery system, population and consumer satisfaction, viewing utilisation as an external validation parameter.

Penchansky and Thomas (1981) described five dimensions of access: availability, accessibility (geographic), accommodation, affordability and acceptability. The authors recognised that these dimensions are not mutually exclusive, and claim that this why in the literature they are all considered to be a part of a single concept.

Millman defined access as “the timely use of personal health services to achieve the best possible health outcomes”. (Institute Of Medicine (U.S.). Committee On Monitoring Access To Personal Health Care Services. and Millman, 1993).

Andersen (1995), meanwhile, defined potential and realised access, whereas Gulzar (1999) alluded to Millman’s findings, mentioning that research into access was slow in the 1990s. Gulzar offered a comprehensive definition that incorporated personal and systems factors; her operational categories included aspatial, spatial, effective, efficient (level of health or satisfaction), continuous, realised (utilisation) and potential access.

Gulliford *et al.* (2001) focused on the user perspective, describing the components of the concept as having and gaining access, in addition to context and cultural settings. For them “*facilitating access is concerned with helping people to command appropriate healthcare resources in order to preserve or improve health*”. These same authors (2002) described health service availability, utilisation and outcome as dimensions of access, also adding equity, which they considered the most important aspect of all.

Norris and Aiken (2006) categorised access attributes into availability, eligibility, amenability and compatibility, further classifying availability into geographic proximity and personal convenience. For them, personal convenience meant office hours, house calls and waiting time. Eligibility referred to the economic qualification of the user, amenability was the willingness to use the system and compatibility was related to cultural and acceptability factors.

For Hall *et al.* (2008), the dimensions of access were based on accessibility; overall, contact, appointment and geographic accessibility. McIntyre *et al.* (2009), on the other hand, presented access as the empowerment of an individual to use healthcare, with the dimensions being availability (physical access), affordability and acceptability. Meanwhile, Fortney *et al.* (2011) accepted the definition of Penchinsky and Thomas describing geographical, temporal, financial, cultural and digital dimensions of actual access to care.

Levesque *et al.* (2013) attempted a conceptual framework for access to healthcare that is based on previous research, incorporating into their framework approachability, acceptability, availability, accommodation and affordability, as well as appropriateness domains. They originated five personal abilities which corresponded with these dimensions, namely the ability to perceive, the ability to seek, the ability to reach, the ability to pay and the ability to engage. They also pointed out that access to different health dimensions interacts and influences each other, maintaining that access is a result of the interaction of the characteristics of people and system.

In summary, access is a complex concept that is influenced by many social, demographic and health system characteristics. While there is no clear understanding of access, there is, nonetheless, an obvious consensus on several components, namely affordability, geographic access and availability of services. The following discussion on the attributes will elaborate on each of these.

Table 1 Some definitions of access to healthcare

Author	Definition
Freeborn and Greenlick (1973)	Individuals should have access to the system at the time and place needed, through a well-defined point of entry.
Aday and Andersen (1974)	Whether those persons actually in need of medical care receive it
Aday and Andersen (1981)	Those dimensions which describe the potential and actual entry of a given population group to the healthcare delivery system
Penchansky and Thomas (1981)	The degree of fit between the clients and the system
Institute Of Medicine (U.S.). Committee On Monitoring Access To Personal Health Care Services. and Millman (1993)	The timely use of personal health services to achieve the best possible health outcomes.
Andersen (1995)	Potential access is the presence of enabling resources. Realized access is the actual use of services.
(Gulzar, 1999)	Access to healthcare is defined conceptually as the fit among personal, sociocultural, economic, and system-related factors that enable individuals, families, and communities to have timely, necessary, continuous and satisfactory health services.
(Gulliford <i>et al.</i> , 2001)	Facilitating access is concerned with helping people to command appropriate healthcare resources in order to preserve or improve their health.
(McIntyre <i>et al.</i> , 2009)	Access to healthcare represents the empowerment of an individual to use healthcare and reflects an individual's capacity to benefit from services given the individual's circumstances and experiences in relation to the healthcare system.
(Fortney <i>et al.</i> , 2011)	A set of specific dimensions that characterize the fit between the patient and the healthcare system
(Campbell and Salisbury, 2015)	The opportunity to reach and obtain appropriate healthcare services in situations of perceived need for care

2.1.8 Attributes

Rodgers (1989) proposed that concepts are made up of attributes, which for her encapsulate how the concept is currently understood. Clarifying those attributes is essential for concept analysis. In this review, I argue that access is composed of six attributes, some of which go under the same name although they have different meanings, and others have various names but are similar in meaning. It should be noted here that by “access” here I mean “accessibility”, i.e. a health system feature that facilitates use of the health service.

- **Geographic access**

This is perhaps the most discussed attribute of access to healthcare in the literature. Aday and Andersen (1974) described geographic access as a function of the time and distance travelled, and since then it has appeared consistently in various wordings. For example, Penchansky and Thomas (1981), along with Campbell and Salisbury (2015), labelled this “accessibility” while Gulzar (1999) called it “spatial access”. For Norris and Aiken (2006) geographic proximity was a component of availability and for Hall *et al.* (2008) distance and time travelled was called “geographic accessibility”.

McIntyre *et al.* (2009) described four components of availability, one of which was the distance between the provider and those who require the service and transport possibilities. Boyle *et al.* (2010) identified three dimensions of access, of which one was physical access, made up of availability of GP’s, proximity, design of premises, telephone access, home visits and electronic access. For (Boyle *et al.*, 2010), proximity included travel time and distance and transport availability and cost.

In the literature, the measurement of geographic access has been carried out either by GIS mapping techniques (Perry and Gesler, 2000; McGrail, 2012; Levesque *et al.*, 2013) or by patient reports or patient satisfaction surveys (Boyle *et al.*, 2010; Auger *et al.*, 2013; Ban

den Berg *et al.*, 2016). It would seem reasonable to suggest that geographic access could be defined as time needed to reach health services, availability of transport and affordability.

- **Access to information**

This has not been widely studied in the literature, but it is implicitly suggested in many frameworks. Freeborn and Greenlick (1973) for example, referred to “*the degree to which the patient understands how the system operates and the benefits and services available.*”. Aday and Andersen (1974), meanwhile, acknowledged that health knowledge is one of the aspatial access attributes: “*the problem in looking at access in terms of criteria such as cost, availability, internal economy, psychological variables, or health knowledge is ...*”.

Gulliford *et al.* (2001) saw knowledge of services as one event in the process of realising access (utilisation), though they did not consider it an attribute. Norris and Aiken (2006) took the same approach. McIntyre *et al.* (2009) suggested the term empowerment as a definition of access, stating that effective communication with regards to health service availability is essential for empowering individuals to access health services. Boyle *et al.* (2010) described the existence of information on appointments and health as one measurement of physical access.

My own view is that access to information is an essential aspect of primary healthcare accessibility. Knowledge about service availability, appointment times, how to manage one’s own illness and how to prevent disease are essential components of this attribute. Validation of this attribute is presented in the qualitative component of this research.

- **Organisational access**

The organisation of the health system in a way that promotes access has, albeit under different names, been consistently recognised as an attribute since 1974.

Aday and Andersen’s framework for the study of access (1974) considered some organisational factors such as appointment and office waiting times as characteristics of the

health delivery system. Penchansky and Thomas (1981) mentioned accommodation as a dimension of access, defining it as the relationship between the manner in which the supply resources are organised, and the clients' ability to accommodate these factors and perception of their appropriateness. For them, these factors included waiting time and walk-in and telephone services.

Gulzar (1999) included organisational resources in the aspatial dimension, stating that "*aspatial access refers to sociopsychological access and is achieved when system and user characteristics including organizational, human and material resources; demographics such as income, age, gender, ethnicity; attitudes and behaviour facilitate access*". For Gulliford *et al.* (2001) accommodation was "*how services are organized*" and they gave examples of opening times, booking facilities and waiting times, as did Campbell and Salisbury (2015). Norris and Aiken (2006) considered organisation as a component of availability, referring to it as personal convenience.

For Hall *et al.* (2008), appointment accessibility and contact accessibility were two distinct dimensions of what they called overall accessibility, whereas Fortney *et al.* (2011) described a temporal dimension of access, which was the time spent waiting to receive the service. McIntyre *et al.* (2009), suggested that system factors are components of eligibility.

In summary, organisational access is a recognised attribute of access and includes time spent waiting for the service, availability of appointments, convenience of office hours and booking times. Structuring the health system around the patient's needs and convenience is at the core of this attribute.

- Affordability

Another common feature of access to healthcare is the economic capacity to obtain health service. This has been expressed in slightly different terms across various frameworks. Penchansky and Thomas (1981) defined affordability as "*the relationship of the prices of*

services and providers' insurance or deposit requirements to the clients' income, ability to pay and existing health insurance". Norris and Aiken (2006), meanwhile, viewed eligibility as *"the economic qualifications of the consumer relative to the eligibility criteria of the service agency"*. McIntyre *et al.* (2009) considered affordability to be the ability to pay for the service, whereas Fortney *et al.* (2011) identified eligibility (for insurance) and affordability as components of the financial aspect of access. Levesque *et al.* (2013), on the other hand, considered affordability to be the people's economic capacity to use resources and time to access appropriate services. Campbell and Salisbury (2015) also recognised affordability as an attribute of access, considering affordability to be the cost of services, including client-perceived worth.

Affordability is an important contributing factor to access to health services and is context-specific. Measuring the monetary value of healthcare is unlikely to provide an accurate measure of affordability, given that currency value, price of services and technologies and living standards differ between and within countries. In addition, not all health systems are similar and eligibility for insurance may not apply outside insurance-based systems. A context-free measure of affordability could generate estimates that are comparable across countries and health financing arrangements: a patient might, for instance, be questioned on how affordable it was to obtain health services, as opposed to asking about specific costs, and this may be more appropriate if it were to adjust for contextual and personal variations.

- Cultural acceptability

Several scholars identified acceptability, providing various analogous definitions. Gulliford *et al.* (2001) defined acceptability as *"the attitudes and beliefs of users and providers about each other's characteristics"*. For Levesque *et al.* (2013) it was *"cultural and social factors determining the possibility for people to accept the aspects of the service"*

and the judged appropriateness for the persons to seek care”, whereas for Campbell and Salisbury (2015) the definition of acceptability was “attitudinal ‘fit’ between client and the characteristics of providers and services”.

Other analyses considered aspects of acceptability with different titles. Gulzar (1999) viewed attitudes and behaviour as user characteristics that could improve access. Norris and Aiken (2006) described compatibility as cultural competence and culturally sensitive care, while Fortney *et al.* (2011) identified a cultural dimension that included language match, provider and public stigma.

Cultural acceptability is a common theme in the understanding of access. It is a measure of the compatibility of the user experience with culture and values. Like affordability, it is a context-specific attribute and can only be measured through patient surveys. This attribute includes issues relevant to respect for the patient’s culture and values.

- Medicine and service availability

All the frameworks and descriptions of access identified adequate supply as an essential aspect of access. Availability of medicines and the presence of medical and non-medical staff when needed are important components of accessibility. This has been referred to as availability (Gulliford *et al.*, 2001; Gulliford *et al.*, 2002; McIntyre *et al.*, 2009; Levesque *et al.*, 2013), physical access (Boyle *et al.*, 2010), accommodation (Campbell and Salisbury, 2015) and contact accessibility (Hall *et al.*, 2008).

Availability of medicines and services at the primary healthcare premises is an important aspect of accessibility. If a patient is referred to a specialist or medical consultant or asked to take a test at a different location or at an inconvenient time, then they are deprived of their right to access the service for reasons beyond their control, which constitutes a barrier to access.

- Other attributes

Other attributes appeared less frequently in the literature. Gulzar (1999), for instance, identified a different spectrum of attributes including effective access, efficient access, continuous access (ongoing access to healthcare), potential access, and realised access (utilisation). I did not include these attributes because they have been mentioned only sparingly, and in my view do not make a significant contribution to the understanding of access.

2.1.9. Antecedents and consequences

Antecedents were identified as events that occur before the event of interest. According to Rodgers (1989), pinpointing antecedents and consequences assist in clarifying the concept. In this section, I shall discuss some antecedents and consequences of access to healthcare.

- Antecedents

Aday and Andersen (1974) mentioned predisposing, enabling and need as components of access. They defined the predisposing component as the elements that describe the propensity of individuals to use services. For them, these were age, sex, race, religion and values related to health and illness. In his behavioural model of access, Andersen (1995) identified two environmental factors as precedents, namely healthcare system and external environment, and three population characteristics. Again, these were viewed as predisposing factors, enabling resources and need.

Gulzar (1999) emphasised that the need for services, along with sociocultural, psychological, financial, and attitudinal factors and distance, architectural issues, and transport may act as access barriers or facilitators. Gulliford *et al.* (2001) on the other hand described a framework in which demand was the direct precedent to access, in which a number of barriers, organisational, financial, individual and social, influenced demand.

Norris and Aiken (2006) simply considered perceived need to be the main antecedent, while Fortney *et al.* (2011) viewed demand for care as predisposed by perceptions of need and access, which were in turn modified by satisfaction.

Levesque *et al.* (2013) proposed a definition in which access is a product of abilities of the population (communities, households, and individuals) and the accessibility of the health system organisation. According to that definition, the need for healthcare, the perception of this need, the desire for care and the seeking of healthcare are prerequisites for accessibility. For Campbell and Salisbury (2015), an increase in access is the result of an increase in system capacity, reducing the demand for care or improving efficiency and responsiveness.

- Consequences

Aday and Andersen (1974) viewed satisfaction as an outcome of the care received, differentiating this from patient values by positing satisfaction as a reflection of patient experience. Andersen's outcomes were perceived health status, evaluated health status and consumer satisfaction (Andersen, 1995). For Gulzar (1999), improved accessibility enhances satisfaction and increases the rate of access (utilisation), while Gulliford *et al.* (2001) specified health outcomes as the main consequence of access. Norris and Aiken (2006) identified improved utilisation and quality of life as well as decreased disparity as positive consequences of access, listing overutilisation and underutilisation as negative consequences.

Fortney *et al.* (2011) focused on the outcomes of improving digital access, arguing that the digital access does not necessarily improve clinical outcomes unless digital data is efficiently managed and used. From their perspective of access as an opportunity, Levesque *et al.* (2013) stated that access leads to healthcare utilisation which includes primary access (first contact) and secondary access (speciality care), and these, in turn, lead to healthcare consequences that include economic, health and satisfaction parameters. Finally, and based

on their review of the literature, Campbell and Salisbury (2015) found that access improved satisfaction, and increased demand and use improved overall health for the population in question.

To sum up, the literature highlights individual, populational, systemic and environmental factors as precedents to access. These could be considered secondary precedents which influence the primary precedents, namely need, perceived need and demand. The consequences of access, on the other hand, are satisfaction, increased utilisation and health, and to a lesser extent quality of life and economic conditions might be considered as outcomes of access.

2.1.10. Related concepts

To further understand a concept and its necessary conditions, Rodgers (1989) replaced the discussion of borderline, contrary, inverted and illegitimate cases proposed in earlier concept analysis methods with the identification and characterisation of related concepts. Rodgers' approach recognises that concepts are interconnected and change over time, and removes the rigid boundaries previously imposed.

My aim here is to present three related concepts: quality, utilisation and satisfaction. I shall discuss the relationship between each of these concepts and accessibility, and justify why these should not be considered surrogates for access. I shall not discuss here other less commonly used substitutes such as effectiveness and equality.

- **Quality**

Donabedian (1988) identified three circles of quality, of which the innermost circle is care by practitioners, followed by care implemented by the patient. The outermost circle is the care received by the community and this circle incorporates access. For Donabedian (1988), Maxwell (1992) and Campbell *et al.* (2000) access was one element of quality of care. Peters *et al.* (2008), on the other hand, placed quality at the core of access, stating that

quality is an important component of availability, acceptability, and geographic and financial accessibility.

Quality of care and accessibility do interact, though Donabedian (1988) and Fortney *et al.* (2011) suggest that the two are independent concepts. Quality healthcare may or may not be accessible, and similarly, accessible healthcare is not necessarily of a high quality.

The purpose of measuring quality indicators is, after all, to understand how well the service is able to manage the patient, mostly from a clinical point of view, whereas accessibility measures the opportunity for entry into the service. These are two different measures. The outcome for each is also independent from the other. For example, Kruk *et al.* (2018) found that five million people died from low-quality healthcare in low and middle-income countries in 2015, amounting to about 58% of all deaths. They concluded that poor-quality healthcare causes more deaths and complications than no access to care, and by doing this they were able to separate out deaths caused by poor quality of care and lack of access (Vallejo-Torres and Morris, 2018; Marshall *et al.*, 2004; Gonzalez-Marmol *et al.*, 2018). The measures for access and quality are different, and so are the outcomes, and this is why it was argued that the two are different concepts.

There is one caveat to be considered here. Quality is a complex construct in which patients' perceptions and responsiveness play a major role, as they do with access. Hanefeld *et al.* (2017) differentiated between clinical quality, which is a biomedically driven construct, and perceived quality which has a direct impact on demand and perhaps on utilisation of healthcare. Clarification of the concepts of access and quality can help to define the boundaries between the two. Concept analysis for quality is, however, beyond the scope of this thesis, and this issue could perhaps be a subject for future research.

- Utilisation

Utilisation was used as both as an indicator and as an outcome for access in earlier literature (Section 2.1.9). Freeborn and Greenlick (1973) stated that utilisation helps to evaluate accessibility, while Aday and Andersen (1974) differentiated access from the availability of services, viewing utilization as a reflection of patient satisfaction and proof of access (accessibility). In a later publication, the same authors defined access as the “*those dimensions which describe the potential and actual entry of a given population group to the healthcare delivery system*”. Access was therefore viewed as an opportunity, whereas utilisation was an outcome in a spectrum of health access measures (Aday and Andersen, 1981).

Taken on its own, utilisation is an outcome of a complex range of structural, behavioural, and social factors. Furthermore, it has been suggested that utilisation does not measure non-use, and that therefore utilisation studies cannot assess facilitators or barriers to access (Dixon-Woods *et al.*, 2006; Fortney *et al.*, 2011).

Measuring utilisation alone offers only a partial picture of healthcare’s ability to fulfil a population’s health needs. Understanding who did not use a health service and why is critical for establishing an evidence base for policy decisions made with a view to achieving universal health coverage. For that reason, utilisation should not be confused with or used as a proxy for access (accessibility) to healthcare.

- Satisfaction

In Aday and Andersen’s framework of the study of access (1974), satisfaction was an outcome indicator of access. They believed that satisfaction and utilisation are interrelated and reinforce each other. Freeborn and Greenlick (1973) measured satisfaction with accessibility as an indicator for ambulatory care performance, explaining that this is a measure of the patient’s perception of accessibility. Penchansky and Thomas (1981)

measured access using a patient satisfaction survey over five domains. They postulated that access has a direct effect on satisfaction, but did not mention whether there were modifying or intervening variables in their model.

Gulzar (1999) presented the view that effective access is a result of patient satisfaction, and efficient access is when satisfaction increases relative to the amount of health services. Here, satisfaction and utilisation interact and result in improved access. Gulliford *et al.* (2001) also considered satisfaction to be a subjective measure of access.

Ricketts and Goldsmith (2005) argued that satisfaction could be independent of access to health service, and that satisfaction with services does not always improve access. Norris and Aiken (2006) expressed the view that access cannot be adequately measured through satisfaction surveys.

When surveying healthcare accessibility from the patient's perspective, patient experience and patient satisfaction are often used interchangeably. It is argued that this is a mistake, as patient experience is a description of what actually happened during the patient's interaction with the service, whereas patient satisfaction is their perception of the healthcare experience (Ahmed *et al.*, 2014).

One definition of satisfaction is "the extent to which services adequately fulfil the expectations of the patients" (Crow *et al.*, 2002). This definition shows that satisfaction is subjective and context-driven, and also influenced by several individual and system-level variables such as age, income, education, marital status, perception and the respondent's health status at the time they were interviewed (Batbaatar *et al.*, 2017). Neither is the degree of association between accessibility and satisfaction known, and for this reason satisfaction is not a specific or sensitive measure of accessibility.

To sum up, quality, utilisation and satisfaction are all interrelated with accessibility. It is in my view, though, that none of these can be used as indicators of accessibility, given

that the relationship between each of these concepts and accessibility is neither direct nor exclusive.

2.1.11. Model case

Presenting a model case enhances clarity by applying the attributes of the concept to the case and showing how these can collectively construct the concept (Rodgers, 1989). In this section, I shall present a fictional character and demonstrate that accessibility may be achieved by way of satisfying all of the proposed six individual domains.

Munir (fictional character) is a 50-year-old accountant who works at an oil company. For two weeks, he has been suffering from frequent urination, thirst and fatigue. The nearest health centre is about 15 minutes drive from Munir's home, but he was worried that his office hours might coincide with the health centre opening times. To check this, Munir called the health centre. An Arabic-speaking lady answered the phone after a couple of rings and asked him respectfully if he needed any help. Munir asked about working hours and explained his symptoms. The lady told him that the centre was open from 7:00 A.M. to 8:00 P.M. every day and explained that he could come at any time and that no appointment was required.

On the following day, Munir went to the health centre at 7:00 P.M. He registered at the counter and was asked to wait. After ten minutes a nurse approached him and asked him courteously to walk into the triage clinic. His temperature, blood glucose and blood pressure were taken, and he was asked why he was visiting and then asked to wait. In the waiting room there was a TV showing some video clips about how to stay healthy, and a table with pamphlets on various diseases.

After 20 minutes Munir was asked to see the doctor, who looked into his symptoms and told him that he might be diabetic. The doctor asked him about the medications he was using and prescribed Metformin for a week. He was referred to a diabetologist and a nutritionist, and informed that he would be notified about appointment times by text message.

On his way out, Munir passed by the laboratory to give his urine sample and the pharmacy to obtain his medication. The costs of the clinic visit, medication and laboratory tests are all covered by the government, and so Munir did not have to pay at the health centre. He received a notification that his appointment with the diabetologist was two days later, and the appointment with the nutritionist on the next day, at the same health centre.

Munir's case has all the attributes of access: geographic access (he was close to the health centre) and access to information (as he received information about how to get the health centre and how to stay healthy and about his diseases). The health centre organisation provided the service conveniently, with a short waiting and referral time. He did not pay for the service, and he was able to afford transport. The service and treatment were culturally acceptable, and all the tests and services provided were at the same health centre.

2.2. Methods for measuring access to primary healthcare

To complement the concept analysis, I investigated how access to primary healthcare is measured, by scanning the review database and creating an inventory of all methods used to measure access. This served to find the most common approaches for measurement, to create a list of patient report questionnaires, and to identify new questionnaire items to complete Access-31.

2.2.1. Institutional measures of access

It was found that access was measured using more than 150 different methods, which included facility-level, healthcare provider-level and patient-level tools. At the facility level, rates of avoidable hospitalisation, sometimes called ambulatory care sensitive conditions and emergency admissions rates were used as an index for lack of access to primary healthcare (Parchman and Culler, 1994; Laditka *et al.*, 2005; Kerr *et al.*, 2005). This index is typically

derived from medical records and assumes that a lack of access to primary healthcare results in increased hospitalisation.

Because it is driven by databases of electronic medical records, using avoidable hospitalisation rates as a proxy does not allow us to measure socio-economic barriers or to identify which attribute of access leads to increased hospitalisation. For example, it is not possible to determine whether accessibility issues are geographical, financial or health system-related unless this information is solicited from individual participants.

The World Health Organization's service readiness and accessibility tool measures facility density and bed density as indicators of access (World Health Organization, 2013). Another health facility measure is the floating catchment area method, which is used to measure the distance travelled to the healthcare facility. Road conditions, availability of paved roads and transport availability are all geography-related factors that are often neglected. As with avoidable hospitalisation, assessment of socio-economic determinants and barriers to access at an individual level is not possible.

2.2.2. Patient primary care questionnaire

Patient questionnaires were also used to measure accessibility as part of a broader evaluation of healthcare performance or quality. Such questionnaires are the most common method used in the literature for measuring access. For example, Spitzer *et al.* (1978) used an accessibility score as part of their assessment healthcare performance, with an index based on the primary healthcare parameters of availability, scope and accessibility.

The Primary Care Assessment Survey (PCAS) includes domains on financial and organisational accessibility. The questions in these focused on patient evaluations of the amount of money paid for healthcare, ability to obtain telephone appointments and convenience of office location and hours (Safran *et al.*, 1998). The General Practice Assessment Questionnaire (GPAS) has seven scales, one of which measured access in eight

questions. One question measured patient reports on same-day availability of GP at times of emergency, and the other seven questions solicited a subjective evaluation of the location, opening hours, access to reception or GP by phone, availability of specific or any GP and waiting time at the surgery (Ramsay *et al.*, 2000).

In the US health scorecard, the access domain consisted of questions on universal participation and affordable care. Universal participation items centred on health insurance availability and lack of access because of cost, while affordable care had questions on percentage of income spent on out-of-pocket medical expenditure and health insurance premiums as well as percentage of adults under 65 years old without a health insurance premium (Schoen *et al.*, 2006).

Donnelly *et al.* (2007) measured utilisation, access and satisfaction of spinal injury patients in three countries. The access component of their healthcare questionnaire (HCQ) included six patient reports on: 1) I can usually reach this doctor within a day; 2) I can get to this doctor's office without problems; 3) I can use all of the equipment necessary at this doctor's office; 4) This doctor will refer me to another specialist when needed; 5) I can get medical care from this doctor whenever I need it; and 6) This doctor will make house calls if necessary. All of these are related to GP availability, and do not address geographical access, access to information, cultural acceptability or affordability.

Another example of a patient questionnaire was that of Schafer *et al.* (2011), who developed the QUALICOPC tool to evaluate quality, equity and cost of primary care systems in Europe. The patient questionnaire component of the tool was developed by searching the literature for relevant questionnaires. QUALICOPC examined quality of care, patient experience, opinions and values over 49 items, some of which were concerned with aspects of access to healthcare.

The Consumer Assessment of Health Plans Study (CAHPS) included access questions which asked about timely appointments, clinic waiting time and access to information as well as respect and out-of-hours availability of the service. This questionnaire also included items on utilisation and regular source of care among others (Agency For Healthcare Research And Quality, 2016).

2.2.3. Patient questionnaires on access to healthcare

In addition to access questions embedded in the aforementioned primary care tools, some authors modelled either questionnaires or question items on earlier frameworks such as Andersen's behavioural model for access (Andersen, 1968). Coughlin *et al.* (2002), for example, measured potential access by asking about usual source of care, continuity, convenience of care and realised access (service use, satisfaction and unmet needs).

In a later study, the same authors asked survey respondents about their usual source of care, any healthcare or emergency visits in the previous 12 months, and flu shots in the last 12 months, in order to measure access. These questions were modelled on the framework of Andersen and Aday (1978).

Wensing *et al.* (2002) measured availability using a satisfaction survey based on five questions: (1) getting an appointment to suit you; (2) getting through on the phone; (3) being able to speak to the general practitioner on the telephone; (4) waiting time in the waiting room; and (5) providing a fast service for urgent health problems. These criteria measured satisfactions with GP availability on a 5-point Likert scale ranging from poor to excellent. Seid *et al.* (2004), meanwhile, presented a framework that was based on Aday and Andersen's potential and realised access, in which they measured availability and use of services.

The European Patients' Forum conducted a survey on access to health in which they measured availability, affordability, accessibility, adequacy and appropriateness of healthcare. This survey included a combination of the patient evaluation and patient

experience questions (EPF, 2016). The majority of patient-reported measures used questions on usual source of care, and other questions to measure access (Littlefield and Stout, 1987; Kirkman-Liff and Mondragon, 1991).

From this review, I was not able to identify a patient questionnaire on access to healthcare which investigated objectively the six domains of interest extracted from the frameworks, namely geographical access, access to information, organisational access, affordability, cultural acceptability and availability of services and medicine. Most questionnaires on access to healthcare contained elements on usual source of care and availability, and some were based on satisfaction scores. The most comprehensive questionnaire was the European Patient's Forum questionnaire, which included a combination of patient reports and satisfaction questions over the five domains.

Although several of the frameworks and concept analyses discussed access to primary healthcare, very few attempts have been made to translate these into measuring tools. To fill this gap in knowledge, in the following chapters I shall present the qualitative validation and implementation of a patient experience questionnaire.

2.3. Concluding remarks

This study analyses access to primary healthcare concept from a relativist viewpoint, using Rodgers' evolutionary concept analysis. Because of the many definitions, frameworks and concept analyses involved in this subject, I have considered this as an evolving concept.

The literature on access does not distinguish between primary healthcare and healthcare in general. The PubMed search engine, for instance, includes the Medical Subject Headings (MeSH) terms "availability of health service", "geographic accessibility", and "health service accessibility", but not "primary healthcare accessibility". I have included indirect measures of access from secondary and tertiary care settings in this review.

Table 2 List of tools that measure access to healthcare

Perspective	Method	Description	Reference
Facility level	Index of accessibility	A-Index	Spitzer <i>et al.</i> (1978)
	Hospital admission rates	Rates of avoidable hospitalization, ACSC	Parchman and Culler (1994); Weissman <i>et al.</i> (1991)
	Emergency admissions		Kerr <i>et al.</i> (2005)
	Health facility assessment	Service Readiness and Availability Assessment tool	World Health Organization (2013)
	Measure of geographic access	Floating catchment area method	McGrail <i>et al.</i> (2017)
Healthcare provider	Perceptions of healthcare providers	Primary Healthcare Engagement tool	Kosteniuk <i>et al.</i> (2016)
Patient	Patient experience	PCAS	Safran <i>et al.</i> (1998)
	Patient evaluation and experience	GPAS	Ramsay <i>et al.</i> (2000)
	Patient evaluation	PCAT	Shi <i>et al.</i> (2001)
	Patient satisfaction	Europep	Wensing <i>et al.</i> (2002)
	Patient experience	Andersen's behavioural model for access	Coughlin <i>et al.</i> (2002)
	Patient experience	BCQ	Seid <i>et al.</i> (2004)
	Patient experience	US. Health System Score Card	Schoen <i>et al.</i> (2006)
	Patient experience	HCQ	Donnelly <i>et al.</i> (2007)
	Patient experience	Aday and Andersen's framework	Coughlin <i>et al.</i> (2008)
	Patient experience	QUALICOPC	Schafer <i>et al.</i> (2011)
	Patient perceptions	Villani	Villani and Mortensen (2013)
	Patient experience	CAHPS ²	Agency For Healthcare Research And Quality (2016)
	Patient experience	EPF	EPF (2016)

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- ² CAHPS = Consumer Assessment of Health Plans Study; GPAS = General Practice Assessment Survey; QOF = Quality and Outcome Framework, EPF = European Patients Forum; BCQ = Barriers to Care questionnaire; QUALICOPC = Quality and Cost of Primary Care in Europe; PCAS = Primary Care Assessment survey; HCQ = Healthcare Questionnaire

It is argued that “access” differs from “accessibility”, “access” being the entry into the service and “accessibility” opportunity or ease of use. This discrepancy may perhaps explain the multiple and inconsistent interpretations of the concept. This thesis will, in any case, explore accessibility from the patient perspective.

Methods for measuring access to healthcare covered in this review include direct and indirect measures. Among the latter were emergency admissions, floating catchment area method, and rates of ambulatory care for sensitive conditions (Parchman and Culler, 1994; Kerr *et al.*, 2005; McGrail *et al.*, 2017).

More recently the reputable Global Burden of Diseases Group has developed a healthcare access and quality index (HAQ) based on rates of avoidable mortality (Fullman N *et al.*, 2018). This global effort has been recognised for its robust methodology, though some limitations have been pointed out. Firstly, it appears that the death rates for various diseases are highly heterogeneous, and the authors of the study state that this complicates interpretation of the results. Low rates of cancer deaths, for example, could be the result of either low screening and detection or improved health system performance. Secondly, the model does not differentiate between mortality caused by primary and secondary care, and this presents important challenges when it comes to using this evidence for planning and improvement of health systems (Goodyear-Smith and Van Weel, 2017). The model also suggests that mortality, even avoidable, is multi-causal, and thus cannot be interpreted based on access alone. The HAQ model reports a better CKD score of 65 for Tanzania, a country with a poorer health system than Taiwan, which reported a CKD score of 50. Wu *et al.* (2018) contest that Tanzania scored higher because of a lower baseline of CKD burden in that country, among other factors, and not because of better access to healthcare.

Patient experience and patient satisfaction were two viable measures considered for the purposes of this research. Patient experience is the occurrence or lack thereof of an event

during patient interaction with the health service, whereas satisfaction measures how well patients' expectations were met (AHRQ, 2019). The two terms are sometimes used interchangeably, but it has been demonstrated that patient experience explains only 10% of the variation in patient satisfaction, whereas 17.5% of this variability could be explained by patient expectation factors (age and education), self-perceived health status and personality (Bleich *et al.*, 2009).

In this study, the aim is to obtain an objective measure of primary care accessibility, and therefore the focus was on developing a patient experience tool. The review reveals that accessibility to primary healthcare has six dimensions;

- **Geographical access:** the distance and the time required to reach the health service, and the cost incurred.
- **Access to information:** information made available to the patient to enable them to use the service. This includes education on prevention and management of disease and how to stay healthy, as well as information on health service office hours, access to medical records, etc.
- **Organisational access:** refers to the way the service is organised to accommodate the patient's needs (surgery waiting time, appointment time, telephone accessibility);
- **Affordability:** the service's capacity for financial protection, i.e. provision of health services without financial hardship;
- **Acceptability:** how the health service accommodates the patient's values and culture;
- **Medicine and service availability:** the adequacy of supplies of medicine and staff in relation to the patient's requirements and needs.

In the following chapters, I use access to primary healthcare domains to update and further validate the questionnaire which I have called Access-29 (Holt and Alasfoor, 2015).

In the qualitative component of this thesis, the questionnaire's content is validated and improved on the basis of respondents' feedback, and the validated questionnaire is then used in a cross-sectional survey of diabetic patients attending primary healthcare services in Oman.

Chapter 3. Methods and Materials

3.1. Selection of study tools

This is an exploratory study of access to primary healthcare in which both qualitative and quantitative methods have been used. In the following Sections (3.1.1,3.1.2), I shall present the process used to develop the Access-29 questionnaire and select the HRQOL tool, and in Section 3.2, the methods for the qualitative component will be discussed, including the translation and cultural adaptation of Access-29 and the HRQOL tool, with both individual interviews and focus groups. The qualitative component will generate a valid tool for use in the cross-sectional survey. Finally, Section 3.3 presents the cross-sectional survey methods, including sample size, sampling and data collection, management and analysis.

3.1.1. Development of Access-29:

The Access-29 questionnaire is based on my previous MSc dissertation, where I listed the tools and measures used to examine access to primary healthcare in a systematic review. Chapter 2 of this thesis has revisited the concept analysis and updated the list of tools and methods to measure access and identified 13 patient-reported measures. In this study I also identified the EPF (2016) survey on access, and included this in the list generated in my previous review.

In designing survey questionnaires, the first step is to identify items that will appropriately answer the research goals, and this may be achieved through literature review, qualitative research or a combination of both (Boynton and Greenhalgh, 2004). In the literature review, I mapped Access-29 items that are consistent with each of the six domains of access detailed in Chapter 2. An update of the earlier concept analysis presented in Chapter

2 revealed the same six attributes outlined by my earlier work, though here the question items were also revised, with the satisfaction and ratings questions changed to objective questions reporting patients' experience (Table 3).

I extracted 29 questions from available validated questionnaires. One of these is QUALICOPC, which is a set of questionnaires that measures cost and quality for primary healthcare. It includes a questionnaire for general practitioners (60 items), a patient experience questionnaire (41 items) from which I extracted 16 items, a patient value questionnaire (19 items) from which I extracted 3 items, and a practice questionnaire (12 items) (Schafer *et al.*, 2013). Seven items in my questionnaire, which I named Access-29 were modified from Coughlin *et al.* (2002), Shi *et al.* (2001), Agency for Healthcare Research and Quality (2015), and EPF (2016), and the remaining three items were suggested by an expert panel in my earlier work (Holt and Alasfoor, 2015).

Using valid and reliable tools is at the core of rigour in research. Face validity establishes that questionnaire items measure what they are supposed to measure, content validity ensures that items are relevant to the domain they belong to, and construct validity demonstrates that the instrument measures the construct of interest (Oppenheim, 1992). I assessed the face and content validity of Access-29 items using the focus group discussions, and tested the construct validity through statistical methods. Psychometric testing of criterion validity that include concurrent, predictive, convergent and discriminant validity were not carried out in this research (DeVon *et al.*, 2007). Reliability measures include internal consistency, test-retest reliability and alternative forms, and while I conducted internal consistency analysis, I did not employ test-retest reliability or alternative forms.

Table 3 Sources of Access-29 questions by domain

Domain	Questions	Sources
Geographical access (Time taken to reach the PHC, availability of transport, affordability of transport)	1. How did you commute to the health centre? (a) Car, b) Public transport, c) Walking, d) Others) *2. How long did it take you to get to the health centre? (a) (0-30 minutes. B) 30 minutes-1 hour, c) 1-3 hours, d) more than 3 hours) *3. In the past 12 months, did you cancel or delay a visit to the health centre because you had no transport? (a) Yes, b) No) *4. In the past 12 months, did you cancel or delay a visit to the health centre because you could not afford transport cost? (a) Yes, b) No)	Schafer <i>et al.</i> (2011), Coughlin <i>et al.</i> (2002)
Access to information (Availability of information on test results, health concerns, responsiveness to queries during and after working hours)	5. Does your doctor or healthcare facility call to inform you about your test results? (a) Yes, b) No). *6. Did you get advice from the health centre/practitioner about how to stay healthy? (a) Yes, b) No) *7. Does your doctor advise you about your health concerns? (a) Yes, b) No). 8. If you call your health facility for questions during office hours do you get an answer on the same day? (a) Yes, b) No) 9. If you call your health facility for questions after working hours do you get answers on the same day? (a) Yes, b) No).	Shi <i>et al.</i> (2001), Agency For Healthcare Research And Quality (2016) Schafer <i>et al.</i> (2011) Also, Seid <i>et al.</i> (2009)
Organisational access (Phone accessibility, appointment availability, clinic waiting time, appointment waiting time)	*10. When I call my GP, the time it takes to talk to someone, (a) 0-10 min, b) 10-30 min, c) 30-60 min, d) more than one-hour, e) it is not possible, no one answers) *11. I know how to get evening, night and weekend appointments (a) Yes, b) No). *12. Did you need to make an appointment for this visit? (a) Yes, b) No) *13. If you needed to make an appointment for this visit, how long did you wait for this appointment (a) 1-2 days, b) 3-7 days, c) 7-30 days, d) more than one month) *14. How long did you wait between the time you arrived and the time you were seen by a GP? (a) less than 15 min, b) 15-30 min, c) 30-45 min, d) 45-60 min) *15. Were you referred to a specialist during the last 12 months (a) Yes, b) No)? *16. If yes, how long did you have to wait for the appointment with the specialist? (a) 1-2 days, b) 3-7 days, c) 7-30 days, d) more than one month).	Schafer <i>et al.</i> (2011) Also, Safran <i>et al.</i> (1998) Ramsay <i>et al.</i> (2000) Shi <i>et al.</i> (2001) Donnelly <i>et al.</i> (2007); Agency for Healthcare Research and Quality (2015)
Affordability (Affordability of consultation and medicines).	17. In the past 12 months, did you postpone or abstain from a visit because you could not afford it? (a) Yes, b) No) 18. In the past 12 months, was there a time you did not take a medication because you could not afford it? (a) Yes, b) No. c) I don't remember)	Expert panel, EPF (2016) with modification

Domain	Questions	Sources
Cultural acceptability (Language, information about illness, privacy, respect).	*19. Has a doctor talked to you in a language you understand? (a) Yes, b) No) *20. In the past, did you have difficulty understanding your doctor or healthcare professional? (a) Yes, b) No) 21. Have you received written or other information about your illness? (a) Yes, b) No) 22. When you are discussing your health conditions or concerns, do you always have privacy? (a) Yes, b) No). *23. In the past 12 months, have you ever been treated with disrespect during your visit to the health centre? (a)Yes, b) No, c) I don't know)	Modified from: Schafer <i>et al.</i> (2011) Agency For Healthcare Research And Quality (2016) Expert panel
Availability of services and medicine (Discussing medications, usual source of care, availability of blood tests and appointments with GPs, specialists and other health professionals).	*24. In the past 12 months, has a doctor talked to you about medications you take, including the ones prescribed by your doctor? (a)Yes, b) No) *25. Do you have a health centre or a personal GP or doctor that you consult? (a) Yes, b) No). *26. During the last year, were you prescribed a medicine that you did not get? (a)Yes, b) No, c) I was not prescribed a medicine) 27. If the doctor asks you to get a blood or other test, is it always available at the health centre? (a) Yes, b) no, c) I was never asked to take a blood test) 28. If you need to see a dietitian, physiotherapist, or another health professional, are they always available? (a)Yes, b) No, c) I was never asked to see them) *29. During the last year, have you had difficulty getting medical treatment because there was no doctor or another health professional available? (a) Yes, b) No)	Modified from Schafer <i>et al.</i> (2011) Agency for Healthcare Research and Quality (2015) (EPF, 2016) Expert panel
Disclaimer: 19 questions marked with (*) are extracted with modification from Schafer <i>et al.</i> (2013). I obtained the authors permission to use these.		

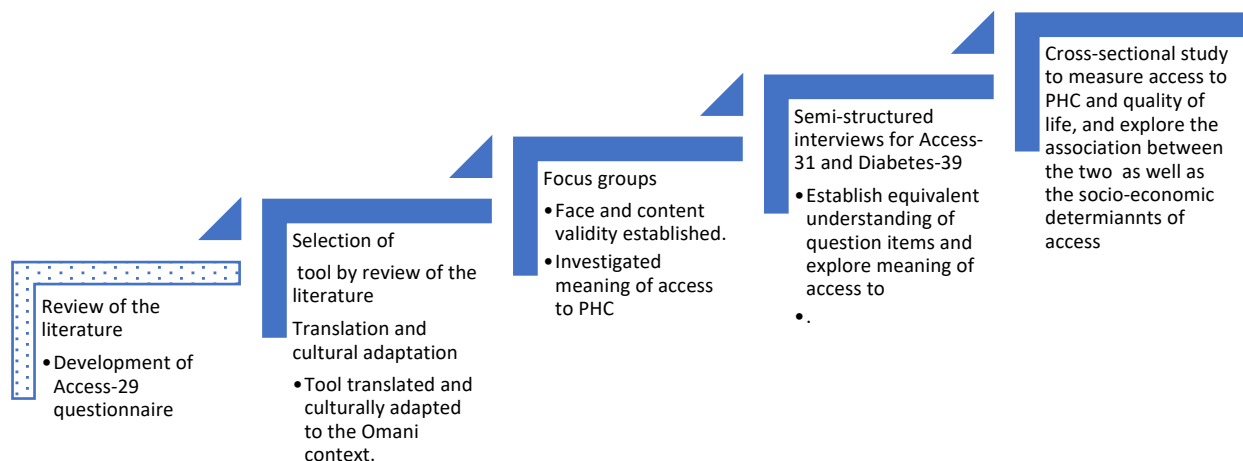
The question items were changed to match the objectives and context. For example, I redrafted the QUALICOPC questionnaire question “How many days did you wait for this visit?” to “If you needed to make an appointment for this visit how long did you have to wait?”, and the possible responses were 1-2 days, 3-7 days, 7-30 days or more than a month. Similarly, Question 23 was compiled from two questions: “The doctor showed disrespect because of my gender / the doctor showed disrespect because of my ethnicity”. With the aim of consolidating these to form a generic question, I changed these to “In the past 12 months

have you ever been treated with disrespect during your visit to the health centre?”. I also modified the question “the opening hours are too restricted”, changing it to “I know how to get evening, night and weekend appointments”.

In this exploratory research, I used the Access-29 questionnaire to measure healthcare accessibility, and I attempted to do this in phases. Figure 5 below shows the stages of this research, with the dotted frame indicating the review carried over from my previous work, and stages 2-5 (in solid frames) showing the various steps taken to complete the study.

In the following sections, the methods used for the translation and cultural adaptation will be described, followed by a qualitative validation and cross-sectional survey of diabetic patients attending primary healthcare facilities in Oman.

Figure 5 Stages of exploratory study on access to primary healthcare and quality of life among diabetes patients attending primary healthcare facilities in Oman (dotted frame indicates process carried over from earlier research, frames in blue indicate stages carried out in this research).



3.1.2. Selection of health-related quality of life measure

Quality of life is a multidimensional health outcome, and patient Reported Outcome Measures (PROMS) of quality of life measure an individual's sense of happiness, well-being and satisfaction. Arguably, quality of life is the most important of health outcomes and it has been extensively researched especially in relation to disease management (Polonsky, 2000). HRQOL measures focus on the impact of disease on personal experience, and the purpose of the literature review in this research was to identify a quality of life instrument for use in a cross-sectional survey of Type 2 diabetes patients attending primary healthcare public facilities in Oman.

From the literature, I identified a recent systematic review by Tang *et al.* (2017) in which the authors screened all diabetes-specific HRQOL tools, and here I followed the framework suggested by Tang *et al.* to select a suitable tool. A number of criteria are suggested, including target population, number and type of dimensions, scores produced, sensitivity to change, number of items, time to complete, number of studies in the past ten years and availability of language translations.

Tang *et al.* (2017) identified 20 HRQOL tools that have been validated for use with diabetes patients, testing either type-1 diabetes, type-2 diabetes, or both. The authors state that the selection of a diabetes type-specific tool is important because the sources of distress may be different depending on the nature and severity of the disease. Out of the 20 tools in the review, I identified 15 that have been validated for type-2 diabetes.

Tang *et al.* (2017) also suggest that, for the study of quality of life, the number and type of dimensions in the tool should be consistent with the objectives of the study. As in this research I did not target a specific quality of life domain, this criterion did not therefore apply and no dimensions of interest were specified.

The third criterion was the type of scoring and the use of sub-scales. Some instruments use only a general score while others are designed to produce sub-scales for each dimension. It had been postulated that instruments with sub-scales have higher sensitivity (lower type II error, i.e accepting the null hypothesis when it is not true), and therefore I chose the measures with sub-scores. Out of the 15 type-2 diabetes HRQOL, two had no sub-scale scores (ADS³ and PAID⁴), and these were removed.

I applied the fourth criterion, namely availability of documented sensitivity to change, otherwise labelled as responsiveness. A responsive measure detects statistically significant changes in response to an intervention or external factor (Eurich *et al.*, 2006). The use of a tool for which sensitivity to change is documented could increase the likelihood of observing statistically significant associations with other variables in the cross-sectional study. After removing tools with no documented sensitivity to change, six tools were thus retained (Table 4).

It is advantageous that the HRQOL tool in question has been used several times in earlier research, as this allows for comparisons between research findings and indicates that it has been validated. Tang *et al.* (2017) suggested that the tool must have been used in at least five studies.

The language translations available is another important factor, and for me this was a determining factor in choosing the HRQOL. As the study was to be carried out among an Arabic-speaking population, it was essential to use a tool that had been validated for use in Arabic (Table 4).

After applying the above criteria, the list of tools was shortened to four HRQOL measures, namely DCP, DHP-18 and DDS, each of which had less than 30 questionnaire

³ Appraisal of diabetes scale (1991)

⁴ Problem areas in diabetes (1995)

items, but none of which had been validated in Arabic. The fourth HRQOL tool was Diabetes-39 which had 39 items and had been validated in Arabic, and I found this to be the most suitable HRQOL measure for use in this study.

The length of the questionnaire and the time required to fill it are important factors. In this study, where both Access-29 and HRQOL questionnaires, as well as demographic questions, are included in the study tool, it was important to manage the time required to fill in the questionnaire in order to improve response rate and data quality. The choice between using a tool validated for Arabic and keeping the number of items low was resolved in favour of the former. In my view, the number of items in Diabetes-39 does not make it unfeasible for this study. According to Lavrakas (2008), online surveys that take more than 20 minutes to complete may generate lower response rate, higher cost and compromised data quality, whereas Rolstad *et al.* (2011) found that response rate is significantly associated with increased length of questionnaires. This is not the only factor, though, as the complexity and content of the questionnaires also play an important role. Preliminary testing showed that the average time taken to complete this study questionnaire (Access-29 and Diabetes-39) ranged between 3 and 85 minutes, and the results chapter contains more information on this.

The Diabetes-39 questions were developed and validated by Boyer and Earp (1997), initially in English, and then translated into several other languages. This instrument has 39 questions spread over five domains: Energy and Mobility, Diabetes Control, Anxiety and Worry, Social Burden and Sexual Functioning, and it solicits on a Likert scale responses on the extent to which diabetes has affected the physical, mental, social and functional wellbeing of type-2 diabetes patients.

Table 4 Selection criteria for quality of life tools for use in a cross-sectional study of Diabetes patients in Oman

Core Characteristic	Profile	DCS-revised	DCP	Diabetes-39	DHP-18	DDS	DOQ 2007
Target population	Type 2	Yes	Yes	Yes	Yes	Yes	Yes
HRQOL dimension of interest	None specified						
Score produced	Subscale produced	Yes	Yes	Yes	Yes	Yes	Yes
Sensitivity to change	Presence of evidence	Yes	Yes	Yes	Yes	Yes	Yes
Number of items	Less than 30	34	20	39	18	17	78
Time to complete	Less than 5 min	-	3-5	-	5-6	-	-
Number of studies	At least 5 studies	24	152	23	12	93	5
Validated language translations	Arabic	No	No	Yes	No	No	No

3.2. Reliability of Access-29 and Diabetes-39

A patient-reported outcome questionnaire “Access-29” was generated to measure access to PHC and the Diabetes-39 questionnaire chosen as a quality of life measure for type-2 diabetes patients. Although individual items of Access-29 were taken from other questionnaires and modified, the tool in its entirety is new. The target population for this study is Arabic-speaking Omani patients, a different language and culture from the setting for which the tools were originally developed.

It was important to translate the two questionnaires into Arabic, and that both Access-29 and Diabetes-39 maintained semantic and idiomatic equivalence in the Arabic version (Evans *et al.*, 2013). Validated versions of Diabetes-39 HRQOL are available in Brazilian Portuguese and Farsi as well as Arabic. Khader *et al.* (2008) also translated, culturally adapted, and validated the Arabic translation of Diabetes-39 in Jordan. This latter country has a different culture and different colloquial Arabic from Oman, and there is no documented

evidence for the equivalency of research tools adapted in Oman and Jordan. Once a questionnaire has been translated, it should be ensured that it is culturally sensitive and comprehensible (Song *et al.*, 2015; Beaton *et al.*, 2000), and for this reason it was necessary to translate and culturally adapt both Access-29 and Diabetes-39 to the Omani context.

In the focus groups, I sought to establish the face and content validity of the questionnaire items, and individual interviews were used primarily to assess the extent to which participants' understanding of the questions was consistent with their intended meaning. A secondary objective of both focus groups and individual interviews was to explore the meaning of access for participants, and to identify inconsistencies between the findings of the literature review and participants' views.

The involvement of patients and the public represents an important part of health and social research, and one which helps to generate high-quality, patient-relevant and culturally appropriate research and study instruments. It is customary to conduct focus groups with the population of interest to inform the development of questionnaires and then to complement these with semi-structured interviews. While the dynamics of the latter may encourage discussion, interviews allow participants to tell their own stories and the intimate setting encourages participants to provide valuable insights (Benjamin F. Crabtree *et al.*, 1993). Individual interviews allow the researcher to understand the questionnaire from the respondent's point of view and are especially valuable as regards new concepts or tools (Brett *et al.*, 2014; Rothman *et al.*, 2009; Green and Thorogood, 2014; Drennan, 2003).

In this section, I shall present the qualitative validation methods used in this study, including the translation and cultural adaptation of Access-29 and Diabetes-39 questionnaires, the focus group discussions to establish the face and content validity of the instrument, and the patient interviews used to verify the acceptability and adaptability of the instrument for the Omani patient. Before data collection, I obtained the approval of the

University of Oxford's Tropical Research Ethics Committee (OxTREC, Ref 548-17) and the ethical review committee of the Ministry of Health, and I followed OxTREC guidelines and recommendations throughout the study.

3.2.1. Translation and cultural adaptation

Initially, I translated and culturally adapted the study tool, namely the English versions of Access-29 and Diabetes-39, following the process described by Beaton *et al.* (2000). Two independent professionals translated the study tool, and then discrepancies were identified and resolved through discussion with both translators. Another two individuals back-translated the Arabic versions, and a similar process was followed to identify and resolve issues and discrepancies. Finally, a meeting was arranged with all the translators and an expert in public health⁵ to discuss the translated (Arabic) and back-translated (English) versions, compare these to the original questionnaire and produce by consensus the tool that was used in subsequent stages of this study.

3.2.2. Focus groups

- **Sampling and sample size**

After selecting a purposeful sample of health centres, I requested the medical officer in charge in each PHC to nominate a contact person. I signed an agreement of work with these individuals, specifying that they were responsible for identifying participants and inviting them to take part in the study, obtaining consent, and organising the focus groups meetings (Appendix 2).

Two health centres in Muscat governorate were selected and focus groups were held for males and females separately. Given that discussing sexuality is taboo in Arab countries,

⁵ Dr. Yahya Al Farsi, Associate Professor of Epidemiology and Public Health, Sultan Qaboos University.

males and female focus groups were separated in order to improve transparency and openness during the discussions (DeJong *et al.*, 2005). Men in Oman possess social power and thus could dominate the discussion during mixed group discussions (Al-Azri, 2012), and separation of gender and social status groups could also encourage discussion of potentially stigmatising issues such as sexual function (Gill *et al.*, 2008).

During the focus groups held at Al-Athaiba health centre in Muscat governorate, I met one group of single men between the ages of 20 and 50 and one group of married women over 50. I also met one group of men of over 50 and one group of single women between the ages of 20 and 50 at the national diabetes centre, and in Al-Batinah governorate I conducted two separate groups of men and women at Saham extended health centre.

Muscat is the capital of Oman and therefore categorised as an urban area, whereas Al-Batinah North is a semi-rural governorate where 27.2% of the population live in rural areas (General census of populations housing and establishments, 2010). The selection of a combination of age, gender and governorate categories was to ensure maximum variation and to include the views of a variety of stakeholders (Krueger and Casey, 2015).

- Data collection

In order to invite the participants to join the study, I provided each contact person with a demographics form and the study protocol (Appendix 3), and this individual then called each subject to explain the study objectives and provide relevant information. To avoid suspicion of fraud and unlawful data collection, the contact person who is a member of staff in each health centre was in charge of inviting participants to join the study. Focus group meetings took place at the health centres in question at a convenient time for participants, and in order to ensure that at least six participants were present, ten were invited for each focus group. On the day before the focus groups, the contact person reminded each participant via text message.

A research assistant and I met each focus group. At the beginning of the meeting, the research assistant provided participants with an information sheet, and they were given the opportunity to ask questions. The research assistant read the information sheets for illiterate participants, who then signed the consent forms, and the assistant collected demographic data including age, gender and marital status (Appendices 4,5).

An interview guide was used for the discussions, starting with open-ended questions about the meaning of access to primary healthcare (Appendix 6). The research assistant handed Access-29 question sheets to focus group members, one domain at a time, and they were allowed five minutes to read each sheet. If the group included illiterate participants, the research assistant read the questions aloud and then comments were invited regarding the face and content validity of each question item, and I also asked whether the questions were comprehensive enough and whether as a whole they represented what they considered to be access to primary healthcare. Finally, the participants were asked if they had any further questions.

- Analysis

The focus group discussions were transcribed verbatim and the transcribed text exported to NVIVO where the data was analysed (QSR International Pty Ltd, 2019).

Content analysis is widely used in health research, and when the categories and codes emerge from the data, conventional content analysis is employed. Coding is an initial step that links data to ideas, and this is a cyclical process in which the researcher identifies codes in the first cycle, and in subsequent cycles these codes are filtered, highlighted and focused to generate themes and categories (Saldaña, 2016).

Conventional content analysis was adopted for the qualitative component of this study. In May 2019, I read each interview multiple times, line by line, carrying out inductive coding. In the second cycle, I categorised the codes and developed the themes. The third

coding cycle, using the revised categories and codes, was conducted in March 2019, at which point the codes were refined and final categories assigned. The findings of this component were used to understand the patients' definitions of access and their experience with diabetes, as well as establishing the face and content validity of Access-29. I also added two new items to the questionnaire at this point.

Diabetes patients attending primary healthcare centres were eligible to take part, and among the criteria for exclusion were type-1 diabetes and gestational diabetes. Preference was given to previously diagnosed patients, and most participants were patients who complied with appointments and medicines as suggested by the contact person at each health centre.

Conducting qualitative research in multiple languages has been extensively researched, but there is no clear recommended strategy for the timing of translation. Most of the research conducted in Arabic has opted to translate the data before analysis (AlKhaldi *et al.*, 2018), including studies conducted in Arabic-speaking countries such as Lebanon (Adra *et al.*, 2015), and Saudi Arabia (Alnasser *et al.*, 2015). On the other hand, Kilshaw *et al.* (2017) translated the text but kept some phrases in the original language. Al-Amer *et al.* (2016) discussed the challenges of conducting qualitative research in Arabic, pointing to difficulties with the grammatical structure of Arabic, metaphors and medical terminology.

Suh *et al.* (2008) suggest that translation during analysis, as opposed to before or after analysis may be the most suitable strategy to reduce loss of meanings of the text. As I (the researcher) am affluent in both Arabic and English, I opted to carry all transcriptions in Arabic, and performed the translation during coding and categorization.

3.2.3. Individual Interviews

- **Sample and recruitment**

At the start of the interviews, each participant was provided with information sheets about the study and allowed sufficient time to ask questions. In line with OxtREC guidance, all participants signed informed consent forms, and they were informed that they were free to withdraw at any time, and that this would not affect the care they received.

All identification data was deleted on transcription, and each participant was coded by the focus group they were in, for example FG1 for focus group 1, P1 for participant 1. Afterwards, all data was confidential. The same procedure was followed for the interviews, with all the data locked in secure locations. All results were presented without mentioning names or identifying personal information.

I used focus group input to update Access-29 with two additional questions, naming it Access-31 at this stage. The following questions were drafted based on interviewees' impressions and thoughts regarding what additional questions might be relevant to access:

“If you are unable to reach the health centre because of an injury or disability, do you know how to contact your GP and receive healthcare?”

“When you talk to your GP, does he explain your illness and responds to your questions in a manner that you are satisfied with?”

For the individual interviews, I selected ten diabetic patients, eight of whom were from a health centre and two purposely selected from an affluent community. The contact person at the health centre recruited the participants by phone and provided information about the study and their role in it. The contact person arranged the interviews at the health centre at a convenient time for each participant. The two participants from the community were invited by phone and an interview arranged in a public place or at my home, according to their convenience.

- Data collection

Prior to the interview, each participant was presented with an information sheet and consent form and asked if they had any questions. The participant information sheet and consent forms were similar to those presented to the focus groups, as described in the previous section. In addition, participants' approval for the recording of the interview was requested.

An interview guide and concurrent probing were used to elicit participants' interpretation and recall of the answers to the questions. Open-ended questions similar to those used in the focus group discussions were asked, and then descriptions of the domains of Access-31 and Diabetes-39 were handed out one at a time. At this point, I checked that participants understood, and verified the relevance of the questions. I recorded the interviews and took notes, and at the end, asked the interviewees if they had any questions or further recommendations (Morlock *et al.*, 2017; Willis and Artino, 2013; Shafer K and Lohse B, 2017).

- Analysis

The interviews were transcribed verbatim and the transcriptions coded on NVIVO 12, at which point I followed a coding strategy similar to that used for the focus groups (QSR International Pty Ltd, 2019). Finally, the questions in the survey instrument were updated and Access-31 and Diabetes-39 questionnaires were finalised for use in the cross-sectional survey.

3.2.4. Data management and storage

The interviews were recorded on a mobile phone voice memo and then downloaded to a personal computer for transcription. After transcription, all files were saved on an external hard drive and electronic copies of the interview stored in password-protected files. The electronic files in this external hard drive will be stored until 2022.

3.2.5. Ethical Issues

Ethical approval was obtained from OxTREC at the University of Oxford and from the ethical review committee of the Ministry of Health. As explained earlier, I followed ethical guidelines in the recruitment of participants, and they were fully informed of the purpose of the study and the procedures involved, and cognisant that they were allowed to withdraw at any time.

3.3. Exploring access to primary healthcare, a cross-sectional study

The quantitative and final component of this exploratory study is a survey of access to healthcare and quality of life among type-2 diabetes patients attending primary healthcare facilities in Oman. In this section, I shall present the sampling methods, and then go on to discuss data collection and quality, as well as data management and methods of analysis. In the survey, I used the instrument validated in the qualitative component of the study.

3.3.1. Research Questions

In this cross-sectional survey I aim to research the following questions:

- a) What are the perceptions of healthcare accessibility in Oman?
- b) Is it possible to obtain a shortened version of Access-31, and what is the internal consistency of this tool?
- c) Is there a significant difference between the governorates in terms of access to healthcare by domain?
- d) How does the disease affect the quality of life of type-2 diabetes patients in Oman?
- e) How does the internal consistency of the translated Diabetes-39 questionnaire compare to the original and to other versions?
- f) What is the variability in quality of life between governorates, after controlling for access?

- g) What is the percentage of patients for whom diabetes is controlled, and does glycaemic control differ between governorates?
- h) Is access associated with diabetes control and quality of life, and what is the relationship between glycated haemoglobin and quality of life?

3.3.2. Selection of the sample frame

The sample frame is the universe from which the study participants are selected, and it includes all members of the target populations. A commonly used sample frame for patient surveys is electronic medical records (EMRs), which has some important advantages. Firstly, in a well-established healthcare service the lists are up to date and include all patients, and secondly these patients are easy to reach, enabling high levels of enrolment. This was observed in studies drawn from EMRs both in Oman and internationally (Grundmeier *et al.*, 2007; Alasfoor *et al.*, 2007).

In this study the target population was adult type-2 diabetes patients living in Oman. All patients attending public health facilities in the Sultanate are registered at their nearest PHC centre and are followed according to a standard protocol. Survey participants were sampled from the EMRs of respective PHCs (Department of Health Information and Statistics, 2017; Ministry of Health, 2015).

- **Choosing clusters**

In 2015, 87,064 diabetic patients were registered at 205 PHC institutions in the 11 governorates of Oman (Department of Health Information and Statistics, 2017). To obtain a representative sample of diabetic patients, stratified random sampling was used. Initially, all PHC institutions in the country were listed according to administrative governorate, and sampling clusters created. These clusters were made up of PHCs in governorates similar in GP (General Practitioner) ratio per 10,000 population, population density and culture. The GP ratio and population density data were obtained from the Ministry of Health's annual

health report, and similarities in culture agreed in consensus with public health experts in Oman. From each cluster, two primary health centres were selected using random number tables (Table 5).

Table 5 was generated in consultation with national experts. Dr Salah Al Mezahmi⁶ advised combining Al-Batinah North and South in one cluster, as they have comparable population density and GP ratio, and are also adjacent and have a similar culture. The same argument applies to Ash-Sharqiyah North and South, as well as Adh-Dhahirah and Al-Buraymi. The governorates of Dhofar, Musandam and Ad-Dhakhliyah, meanwhile, were represented as individual clusters, as the population density and GP ratios in those governorates are different, and discussions with experts also confirmed differences in culture and social customs of the two governorates.

One governorate in the middle of the country (Wusta) has a population density of one per sq km and most of its inhabitants are travelling Bedouins. It was logistically complicated to get a representative sample of this governorate because it is a remote area and the population is scattered (Figure 6). To improve the chances of including the population of Wusta in this study, I included the two health centres that were closest to Ash-Sharqiah in the sampling frame of that governorate, and the two closest to Dhofar in that sampling frame.

⁶ Dr Salah Al Mezahmi, Director, Research and Development Indicators, GCC Statistical Center, Muscat-Oman

Table 5 Regional stratification for sample size clusters for study on access to primary healthcare among diabetic patients in Oman

Region	Population density (per squared Km)	HC GP ratio per 10,000	Cluster	Rationale
Muscat	346	5.5	Muscat	Largest populated urban area in Oman; the capital.
Dhofar	4	7.2	Dhofar	Remote area; rural
Musandam	23	20.7	Musandam	Remote area
Adh-Dhahirah	7	11.2	Adh-Dhahirah	Merged because of proximity and culture
Al-Buraymi	6	10.5		
Al-Batinah North	87	0.4	Al-Batinah	Proximity, culture and similar health services indicators
Al-Batinah South	83	0.6		
Ash-Sharqiyah North	14	9.3	Ash-Sharqiyah	Proximity, culture, and similar health services indicators
Ash-Sharqiyah South	15	10		
Ad-Dhakhliyah	13	10.4	Dhakhliyah	Some health centres to be included with the sample from other regions
Wusta	1	13.5		

3.3.3. Sample size calculations

Sample size calculation was based on two assumptions: firstly, that both the independent variable, i.e. glycated haemoglobin as measured by HbA1c (controlled and non-controlled), and the dependent variable (access to PHC) are binary; and secondly, that the observations are independent. I based my calculations on the Mantel-Haenzel test because it is used to analyse 2*2 tables, and is consistent with the aforementioned assumptions (MacDonald, 2014).

As regards the association between access to healthcare and glycated haemoglobin among diabetes patients, there is limited research that can be used for calculating the sample size. The only available study at the time of data collection was by Zhang *et al.* (2012), in which the authors found that patients with no access to healthcare (uninsured) were more likely to have poor levels of glycated haemoglobin. The Odds Ratio (OR) for this was 2.5 in the non-adjusted model, and after adjusting for age, sex, race, marital status, education, family

history, smoking and self-reported health, the OR for poor levels of glycated haemoglobin remained 2.4, compared to those insured.

The percentage of diabetes patients with glycated haemoglobin in Oman ranged between 22% and 60% according to the literature (Al Rawahi *et al.*, 2017; Alghafri *et al.*, 2017b; D'souza *et al.*, 2015; Al-Sinani *et al.*, 2015). To calculate the sample size needed for the cross-sectional study, I assumed that 40% of diabetics had good levels of glycated haemoglobin, and that the OR of poor diabetes control for those with low access to healthcare (HBA1>6.5) was 2.4 (Zhang *et al.*, 2012). My aim was for 0.05 Type 1 error (α) and 80% power of analysis (β). Based on these assumptions, the sample size required for this study was 230 per region, a figure that was inflated by 15% to adjust for non-response and exclusion criteria. The sample size from each stratum was 264, or 1,848 for seven clusters, and a sample size of 132 was allocated for each health centre.

3.3.4. Selection of participants

Public primary care services in Oman are offered through PHC centres, extended health centres and some local hospitals (Department of Health Information and Statistics, 2017). For a random sample of institutions, I listed all primary care facilities and used random number tables to select two from each cluster using Microsoft Excel (Office 365, 2017). To select study participants, a list of patient IDs was obtained for each chosen PHC facility and a random sample of 132 patients drawn. Because the sample frame included only public PHC facilities, patients who attended only private clinics were not represented, and this could be identified as one limitation of this study (Martínez-Mesa *et al.*, 2016).

- Recruitment of survey staff

At each study site, the medical officer in charge identified a contact person. An agreement of work was signed with each contact from participating health centres, as well as contract agreements with a data manager, a quality assurance person, and a research assistant.

These agreements outlined the roles and responsibilities of each party, and the team member allowance (Appendix 2).

According to OxTREC, sensitive data should be collected using tools that have passed the Infosec Third-Party Security Assessment (TPSA). Because I am collecting sensitive personal information related to patient age, sex, names, etc, I explored a number of data collection options that fulfilled OxTREC requirements, and obtained their approval to use the online questionnaire tool “www.smartsurvey.com” (Patrick. M, 2018).

I created the study questionnaire, composed of two online questionnaires, on 6th July 2018 on Smartsurvey.com. (2018) . This consisted of: 1) a participant consent form to document the patient’s willingness to be contacted and their consent to participation (information that was also used to follow up and monitor responses and to analyse non-response data); and 2) a patient questionnaire, including informed consent and the survey instrument.

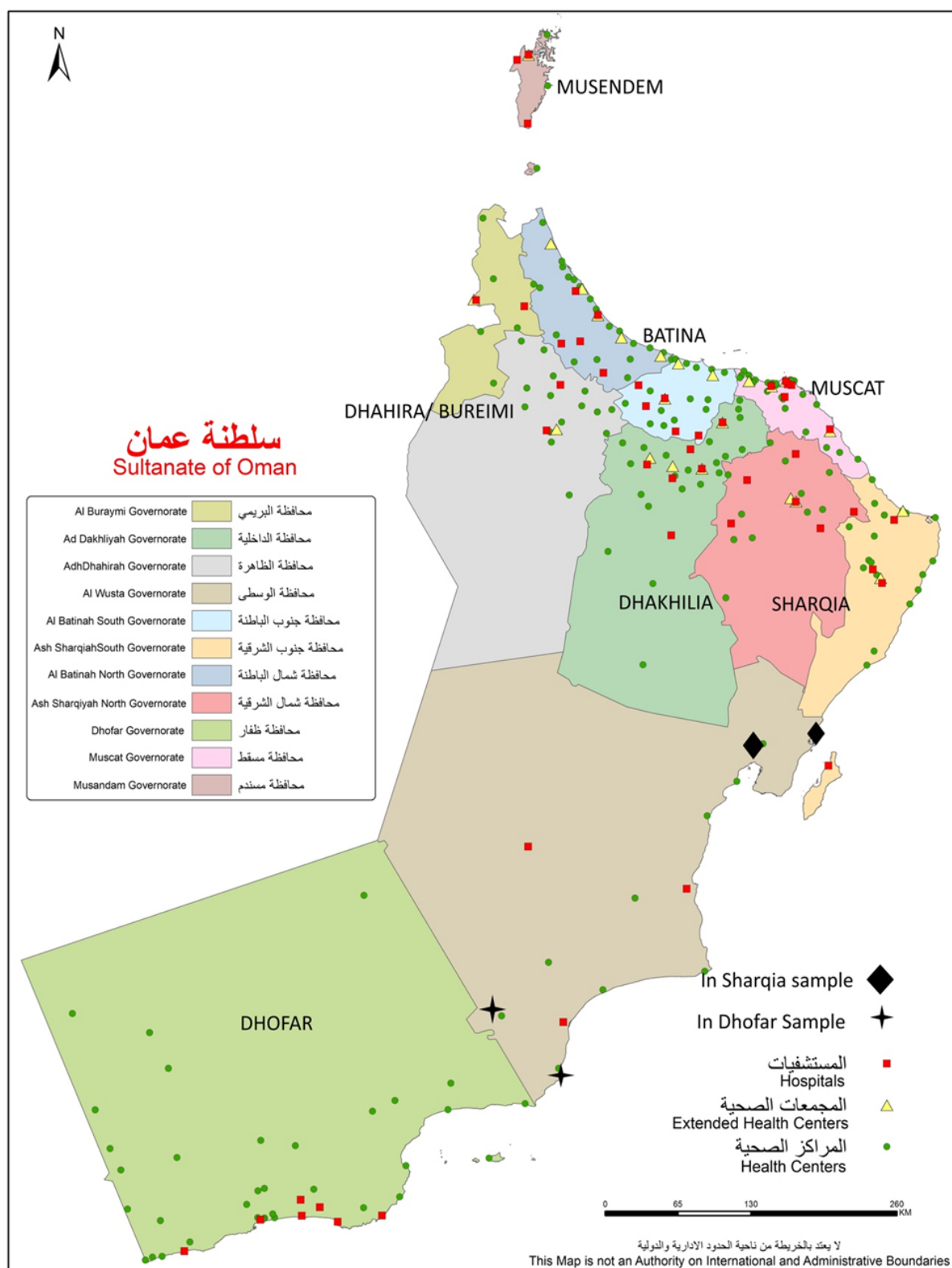
- Screening and inviting participants to join the study

Initially, the medical register staff at each participating institution provided me with an electronic list of IDs for type-2 diabetes patients who made visited the centre between 1 August 2014 and 20 October 2018. The data manager removed duplicate entries and type-1 and gestational diabetes cases from this list, and then selected a random sample of 132 patients using the data select function in SPSS (George and mallery, 2007). Lists of sample IDs pertaining to each institution were then emailed to the respective contact individuals.

To invite participants to take part in the study, the research assistant provided the contact individuals with a field guide and an individualised link to the screening questionnaire. As the contact called each person in the sample, they entered the participant’s response on the online patient consent form using the hyperlink provided.

The study invitation form started by asking the patient if they were willing to be contacted for the survey. If the patient refused, the electronic form automatically closed. If the patient agreed to be contacted, the contact person asked them to answer the survey either online or by visiting the health centre, explained the study objectives to those patients who agreed to be contacted and invited them to take part (Appendix 7). Those who refused were thanked.

Figure 6 Map of the healthcare and survey sample distribution in various governorates in Oman



A link was sent by WhatsApp messenger (WhatsApp Inc, 2019) to patients who agreed to take the online survey, or else the contact person asked the patient to visit the health centre and complete the survey questionnaire. To improve the response rate, the contact person called non-respondents three times and followed this up with three WhatsApp message reminders. After recruitment was completed, the smartsurvey.com text message function was used to send survey reminders to the remaining non-respondents up to 9 January 2019.

At some study sites, the total number of patients was lower than 132. In that case, I included all patients in the survey and obtained an additional sample from the following health centres on the list of institutions. In Dhofar governorate, Shehab Saib Health Centre had only 33 type-2 diabetes patients, and therefore 100 patients were sampled from Al Saada Polyclinic in the same governorate. Similarly, in Musandam governorate, only 66 patients were listed at Lima PHC, and so this number was complemented by patients from Madha PHC, which had only 52, and then the remaining 14 sampled from Daba local hospital.

- Participant survey

The participant survey electronic form was designed to be user-friendly, to ensure compliance with sound research ethics, and to maximise data quality.

The first page of the patient questionnaire provided the option for completing the survey in Arabic or in English. The second page displayed survey information as per OxTREC guidance and ended with “Do you have any questions?”. If the respondent had a question, the electronic survey closed, and the quality assurance person and I both received a notification, at which point, the quality assurance person called the respondents, resolved their issues, and resent the link.

If after reading the information page the patient did not have any questions, they were directed to the consent form, where the question “Do you agree to participate?” allowed them

to opt out of the survey if they wished to do so. If the patient chose not to continue, the survey form closed, and the patient was recorded as a refusal. When the patient agreed to proceed and complete the questionnaire, they were directed to the survey instrument (Appendix 8).

Participants were given a chance to ask questions at two points: when the contact person called to recruit the patient, and after the respondent opened the questionnaire form. Respondents were also only able to access the questionnaire after giving their consent to take part in the survey. This procedure has been approved by OxTREC (Reference number 523-18).

3.3.5. Pilot testing and feasibility

A quality assurance (QA) person collected pre-test information. Within a week of sending the survey link, the QA person called each of the first 30 participants to ask questions on ease of access and completion, enquiring whether the questions were clear and asking about the time taken to fill in the questionnaire. Non-respondents were also asked why they did not access the link and whether there were any logistical issues such as internet speed, connectivity, comprehension of survey procedure, etc. The study tool was then modified in accordance with the problems identified.

This pre-test revealed that some of the questions were unclear. For the question “number of family members”, for example, participants did not understand whether this referred only to those living in the same household, or whether it also included those not living in the same household. Most participants, too, had difficulty filling in the ranking in the quality of life questionnaire, and some felt that the sexual function questions in the quality of life questionnaire were not applicable to them.

In the primary healthcare accessibility questionnaire, in Q27: “If the doctor asks you to do a blood or other test, is it always available at the health centre?”, it was unclear whether it meant that the test in question was available at the same or at another health centre. Some

respondents were uncomfortable answering the question on income, and they suggested adding: “no fixed income” as an option. Other respondents said they did not know what type of diabetes they had.

Some respondents reported that the survey link was inaccessible at times because of a slow internet connection. When the questionnaire was accessed, the average time taken to complete it was 28 minutes and 32 seconds, ranging between 4 minutes 33 seconds and 85 minutes 22 seconds.

The questionnaires were modified in accordance with participant feedback before proceeding with the survey, and the pilot survey data was included in the final analysis.

3.4. Data management and analysis

Throughout the survey, recommended data management and analysis methods were followed in order to maintain data quality and obtain valid results.

3.4.1. Data quality and response rate

During data collection, partial forms and missing patient information were monitored daily. Most partial and duplicate responses were because of weak internet or outages. The QA person discussed these frequently with the contact individuals in each health centre.

One of the purposes of monitoring data quality was to ensure the accuracy of the sample. To that end, once data collection was complete, the screening dataset of each health centre was downloaded on individual Excel spreadsheets and missing and incorrect IDs were identified by matching the patient IDs in the patient database with the screening list.

To improve response rates, the contact person called each non-respondent a maximum of three times. After completing recruitment, a weekly text message auto-reminder was generated from the smartsurvey.com website between 15 October and 30 December 2018.

To monitor data accuracy, a designated quality assurance person contacted a random sample of 5% of the respondent list and administered a QA questionnaire. This sample was generated by random number function on SPSS, and QA questions were designed to verify the completeness and accuracy of data.

3.4.2. Data management and analysis

The questionnaires were pre-tested on 30 participants and the feasibility of the study evaluated on the basis of estimates of response rate, time required to fill in the questionnaire and completeness of data. A designated QA person contacted each respondent in the pre-test sample to obtain information on feasibility, ease of questions, the flow of the survey instrument and reasons for non-response (Bouwman *et al.*, 2013; Forouzan *et al.*, 2014).

After successful completion of the pre-test, data collection began at all study sites, two centres at a time. After data collection was finished, the two data files were imported to SPSS, at which point unnecessary data and all identification information such as names and telephone numbers were deleted.

To analyse the survey, the data was imported from the online platform into SPSS. For data cleaning, a unique ID code was generated using the governorate and institution code (with the formula governorate $((ID * 1000000) + \text{Governorate ID})$), with a view to generating a unique identification number for each observation. After this, frequency analysis was run for all variables and outliers and duplicate patient IDs identified. Relevant variables were cross tabulated: for example, governorate was cross-tabulated with cluster and health centre to identify discrepancies. For HbA1c, the outliers were verified from the original data file, and in one case through the contact person. Values outside the data range were set to missing.

The assumptions for normal distribution of HbA1c, indices for the access domains, and quality of life domains were tested, and tables generated to identify and correct inconsistent entries. Afterwards, the screening and patient files were merged for final analysis, and

frequency analysis run on the merged files to detect outliers and incorrect entries for HbA1c and to examine consistency between the governorates and health centres. At this point all inconsistencies and outliers from the original online database were corrected, and governorates recoded into clusters, categorising age, income and HH variables. For HbA1c, a binary variable was generated at the cut-off point of 6.5%, based on the guidelines of the National Institute for Health and Care Excellence for monitoring diabetes (NICE, 2015).

Following Jenkinson *et al.* (2002b), Access-31 was coded into Problem / No Problem scores, with “Problem” being a response that signifies a barrier to primary healthcare accessibility, and “No Problem” one that indicates no barrier to accessibility. Details of the scoring for each question are further explained in the results section (Section 5.2).

The quality of life scores were coded according to the Diabetes-39 scoring instructions provided by the original authors (Appendix 9). Initially, I ran frequency analysis to identify the number of missing values for each variables and observation, and observations with more than three items in both “diabetes control” and “energy and mobility” domains, one item in “anxiety and worry” and “social burden” domains, and zero items in the sexual function domain were then removed from the analysis, and the sum for each domain calculated, generating the score on a percentile scale (0-100).

After this, I ran cross-tabulations of access to primary health domains, quality of life domains and glycated haemoglobin against governorates, income, gender, education and nationality each at a time, generating measures of association using Chi-squared statistics and I also ran the same analyses weighted for non-response rates and examined internal consistency for Access-31 and Diabetes-39 by KR-20 and Cronbach’s alpha analysis respectively, generating item correlation matrices for access to primary healthcare domains.

Finally, I ran multiple regression to understand the association between access, quality of life and glycated haemoglobin after controlling for governorate of residence and socio-economic indicators.

Chapter 4. Patient perspectives on access to PHC

4.1. Introduction

I conducted the qualitative component of this exploratory study with a view to developing a valid and culturally appropriate survey instrument, namely the Access-31 questionnaire to measure access to primary healthcare and Diabetes-39 HRQOL. I also included socio-economic indicators and diabetes control as measured by glycated haemoglobin (HbA1c).

To obtain a valid instrument for use in a cross-sectional survey in Oman, both Diabetes-39 and Access-29 questionnaires were translated and culturally adapted following recommended procedures (Wild *et al.*, 2005). I shall discuss the findings of this exercise in Section 4.3. The Arabic version of the questionnaire was then qualitatively validated using focus groups. At this stage, I aimed to establish the face and content validity of the Access-29 and Diabetes-39, updating the instrument with feedback from the focus groups and using it in the semi-structured interviews, which were to ensure that the patients' understanding of the questions was consistent with their intended meaning.

I followed interview guides during the discussions in the focus groups and structured interviews. Each focus group or interview started with open-ended questions about experience of diabetes and PHC accessibility. Focus group participants were then asked to comment on the face and content validity of the questionnaire items, and similarly interview respondents were asked to explain how they understood the survey questions.

In this chapter, I shall present the process and findings of the qualitative component, and at the end of the chapter I shall provide an interpretation of the findings in comparison with the findings of the literature review in Chapter 2.

4.2. Developing the study instrument

In my earlier review I found six areas of access to primary healthcare in the literature, namely: geographical access, access to information, organisational access, affordability, cultural acceptability, and availability of services and medicines. The tools and measures used for access to PHC were also reviewed, and relevant question items extracted in order to develop a comprehensive patient-reported tool.

For this exploratory study, concept analysis and tool development were revisited, and then Access-29 and Diabetes-39 translated and culturally adapted. After this, focus groups were conducted to validate the survey instrument. On the basis of focus group discussions, I added two questions and changed the name of Access-29 to Access-31.

In this study, I also reviewed the quality of life tools available and selected Diabetes-39 HRQOL (Section 3.1.2). This tool was translated from its original format and the necessary changes made to improve patients' understanding of the Arabic version of the questions. I avoided changes that might alter the core meaning of the questions.

4.3. Translation and cultural adaptation.

I started by combining Access-31 and Diabetes-39 into one study instrument, and then commissioned two professionals to translate this into Arabic. Discrepancies between the two translations were resolved by discussion.

Some inconsistencies which were the result of cultural and/or context-related interpretations were found in the in translations. For example, Q6 in "Access-29" was "*Have you received advice from the physician or health practitioner?*", but the term "health practitioner" is not commonly used in Oman, and therefore the question was adapted to "*During the last 12 months have you received any information from the health centre or health workers ...?*". Similarly, the exact translation of Q7 was: "*Does the doctor talk to*

you about your health fears?”, but the translators felt that “fear” was too strong a word, and so it was changed to *“Usually, does the doctor give you advice about what worries you with regard to your health?”*.

Some questions were modified to improve language consistency and contextual resilience. For example, the questions that were in the first person (e.g. *“I know how...”*) were changed into the second person (*“Do you know how...?”*) and the phrases *“the past 12 months”* or *“usually”* were used where possible instead of *“today”*. These changes were applied to questions 7,13, 14, 16, 17, 18, 19, 23, and 24, and in Questions 10-12 the phrase *“when I call”* was changed to *“when you call”*, in order to ensure consistency throughout the questionnaire. There were no discrepancies that warranted change in the translations for the quality of life questionnaire.

Two different individuals who were familiar with the study carried out the back-translation into English. After this, a meeting was convened with all translators and a public health expert (Dr Yahya Al Farsi) to discuss and compare all versions of the questionnaire. It was decided to modify some terms to improve the readability of the questionnaire, using, for example, the Arabic word for “arrive” instead of “commute”, “doctor” instead of “GP” and “skip” instead of “abstain”.

It was not possible to identify Arabic equivalents for some terms. In Q2 of “Access-31”, the terms “postpone” and “delay” both convey the same meaning, and so we agreed to choose the simpler Arabic translation. In Q6, meanwhile, translating the term “stay healthy” proved challenging, and therefore it was decided to use the Arabic equivalent for “maintain your health”. Some terms were also altered to improve clarity. In Q13 and Q16 of “Access-31”, for instance, the phrase *“How long does it take you to get an appointment?”* was changed to *“How long does it take you to see a doctor?”*.

There were fewer disagreements regarding the back-translation of Diabetes-39. The translators felt that the term “restrictions” in Q3 carried the meaning of “imprisonment”, and it was changed to the Arabic equivalent of “following”, while in Q11, the term “requirements of the disease” was not clear, and so it was changed to “diabetes”. In Q16, the phrase “blue” had no equivalent translation in Arabic and it was therefore deleted in favour of the word “upset”, while in Q19 “things” was used instead of “procedures”. In Q25, meanwhile, the translators felt that the term “overall energy level” implied that the person should pursue athletic-level exercise, and therefore “general activity level” was used instead. Similarly, in Q29 the term “importance of exercise” was employed rather than “exercise requirements”, and the translation “interrupted sleep” was used in Q38 to convey the meaning intended in the original questionnaire.

4.4. Focus group discussions

Focus groups and/or structured interviews involving the population of interest are accepted methods for developing questionnaires (Nasser-McMillan and Borders, 2002; Ricci *et al.*, 2019). In this research, focus groups were used to evaluate the face and content validity of Access-29, and structured interviews were then employed to ensure that the meanings of the question items in Access-31 and Diabetes-39 were consistent with their intended meaning.

Krueger and Casey (2000) advise planning for two to three focus groups for each type of participants. I conducted six focus groups to ensure a maximum variation sample and within-group homogeneity (n=25). The language of the focus groups was Arabic, and their duration ranged between 20 and 55 minutes.

The six focus groups were conducted between 31 December 2018 and 14 February 2019. In each group there were four to six participants, totalling 25, with nine males and sixteen females. The mean age of the participants was 47 years, and 40% were below the age

of 50. The percentage of participants who had had diabetes for more than 5 years was 40%, and 60% were married and 65% had some education (Table 7).

Table 6 Characteristics of focus group participants in the study of access to primary healthcare among diabetic patients in Oman

Characteristics		N	%
Age	<50	10	40
	>=50	7	28
	Undeclared	8	32
Gender	Males	9	36
	Females	16	64
Education	Illiterate	10	40
	Educated	14	56
	Undeclared	1	4
Duration of Diabetes	Less than 5 years	4	16
	>=5 years	10	40
	Not declared	11	44
Marital Status	Married	15	60
	Single	5	20
	Not declared	5	10
Treatment	Oral Insulin	8	32
	Injectable	8	32
	Not declared	9	36
Total		25	100

4.4.1. Access to healthcare

It is noteworthy that the literal Arabic translation of the terms “access to primary healthcare” and “primary healthcare accessibility” is “the extent of ease of reaching primary healthcare”. This should be taken in consideration when interpreting the findings of the focus groups.

- **What does access to healthcare mean?**

In some focus groups, patients were reluctant to provide a meaning, insisting they had never heard the phrase before. In other groups, the meaning of access was multidimensional, with some participants mentioning distance as one component of access and others talking about appointments and services. Access to information was also mentioned in one group.

Some statements on the meaning of access to PHC were:

“If the health centre was nearby, of course there would be ease of access” (FG 4).

“I should be able to see the doctor on time and receive my treatment” (FG 2),

“It means they follow my case, whether in the health centre or the hospital, getting my consultations, getting the medicine, necessary tests.... this is what it means.”

(FG4).

“Ease of getting information from the person (i.e. health worker) to the patient.”

(FG5)

A new aspect raised by the focus groups was the ability to reach disabled patients:

“In my opinion, the patients should be prioritised. For example, I have a handicapped daughter, and they do give her priority. Honestly, this is excellent” (FG1)

Focus groups revealed that accessibility was not limited to physical distance to the healthcare facilities but also included other aspects of service organisation and availability. Information, timely consultations, tests and medicines were seen as part and parcel of PHC accessibility. Affordability was not mentioned, perhaps because the participants received free healthcare, and so this was not an issue for them.

- **Access to information**

I sought to clarify what types of information are important for the health centre to share from the participant's point of view. Discussions revealed that information about appointment

times, access to medical files and information on managing diabetes were important. Patients also pointed out that the medical reports were generated in English, a foreign language.

“They should send us the test results.” (FG2)

“I had a situation, they took tests in one health centre, and they needed to repeat the test for confirmation, and nobody called. I was travelling and I forgot about it. I remembered three months later, but where were you? And when I came today, they told me that I had to rush to the Royal Hospital.” (FG4)

“It means they should give us the right information that leads us to the right path.”

(FG5)

“The question is excellent. It means if you took a test it is necessary that they tell you..... Currently, the hospital or the health centre do not tell you the results until your appointment 3 or 4 months later....”. (FG3)

“Usually when we go to the health centres or hospitals, they give us the medical reports in English. If it was possible to get it in Arabic..... I speak Arabic not English; my mother tongue is Arabic....when I get the report, I do not understand anything, I only understand what the doctor explains.” (FG3)

- Organisational access

Most comments in this section were on delays in appointments, particularly as regards referrals to secondary care facilities, i.e. hospitals. Accessibility over the phone and in the afternoon were problematic, with a typical statement about telephone accessibility being *“they never pick up the phone”*.

“It is true there is a delay, delay in appointments. Several issues, firstly, delay in referrals. This means the disease lingers and they do not refer you, they keep experimenting with medicines, once, twice and three times.” (FG2)

“I got a referral to X polyclinic, and they gave me an appointment six months later.”

(FG1)

“I was referred to a hospital and was given a slot one year later, I was already

bedridden at that time.” (FG1)

“I never heard about afternoon appointments. I wish we could have these...” (FG2

and FG3)

“What’s the point if I see a GP and then he refers me to another doctor in the same health centre? This is a waste of time.” (FG5).

“A few weeks ago, one patient went to see her specialist, but the specialist was busy. Another doctor saw her and stopped her medication, she ended up with complications.”

(FG3)

The daughter of one participant commented that:

“Sometimes we do not get a place to sit, she sits a long way away, and I have to go back and forth to check if her name came up,” (FG2)

“When you come for your appointment you have to wait for a long time.” (FG6)

- Cultural acceptability

A predominant theme when talking about experiences of healthcare in Oman was the treatment. Health staff were generally viewed as courteous, devoted and knowledgeable:

“Honestly, calling them worthy of respect is an understatement. Honestly, I mean all of them are worthy of respect.” (FG2)

“See, in this health centre the staff never fall short in fulfilling their duty, in spite of the large number of diabetics here, they do their best.”

“We salute the Omani staff, Honestly, they are more considerate. you feel they are knowledgeable, and also they love to serve the patient.” (FG5)

However, some participants hinted at the short temper of some physicians:

“There are doctors who do not like the patient to talk about things. They give short answers, and you are not encouraged to discuss and ask questions.” (FG4)

- Availability of services and medicines

Opinions on the availability of medicines were conflicting, with most patients saying they had to buy the medicines, and others saying they were available.

“We face difficulties getting the medicines, they are always late.” (FG3)

“When the doctor prescribes the medicine, you have to buy it outside.” (FG5)

“Honestly we buy some medicines from the pharmacy.” (FG6)

On the other hand, there were comments like:

“As for the medicines, they are available. ... they send my order here from the Royal Hospital every month, I receive them. Everything is available.” (FG4)

“Because the doctor is always there, and medicines are available. We never went to a health centre and were told that the doctor was not available, so this question is not necessary.” (FG3)

The quality of the medicines, though, was an issue of concern:

“Why don't they get the German pills? They are the same but without the side effects.” (FG5)

“The medicines provided by the Ministry of Health are the worst, I am telling you the truth.” (FG3)

4.4.2. Living with Diabetes

- Diabetes control

Most participants thought they were responsible for controlling their diabetes. A typical response was “the patient is his own doctor”. For them this included maintaining a healthy lifestyle, taking medications and following up with their specialist or GP as scheduled.

“Gaining control” was a recurrent theme, and the majority said they were in control of their diabetes. Others who did not feel in control said that caused them distress and frustration.

Describing how they controlled diabetes, patients explained:

“On the contrary, there are no constraints, when you organise your life. That means the person should lead a healthy life, that’s the best thing. Especially with food.” (FG4)

“In this disease the first thing is that the person should take care of himself to a very high degree. The first thing is to manage your life with the family, from the “thinking” side (i.e. worries), family problems and such things..., organise food, walks, ... exercise is needed, of course, I have had diabetes for 30 years, since I was 26, and my sugar level is 6.7.” (FG5)

“Commitment is needed.... Since I got the disease my sugar levels seldom goes above 6 or 7, the maximum it reached was 7.5. I have a family doctor that I consult with from time to time and she tells me what to do. The diabetes patient is his own doctor.” (FG2)

- Coping with Diabetes

Many patients believed that diabetes came from “Allah”, although quite a number listed family history and lifestyle as causes. The belief that diabetes is a test from God could be a way of rationalising being ill and trying to accept it, though it could also imply frustration. Organising one’s life around medications seemed to be an issue that many patients were unable to solve:

“I don’t know where this came from. Thank god, it’s all from him.” (FG1)

“We do not feel embarrassed; it is given by Allah.” (FG4)

Some people expressed their feelings, about feeling old, out of control and disorganised. These were some of the statements representing this:

“We are old.... we do not know anything, whatever our children tell us we follow.”

(FG1)

“There is no organisation, you get up at 6 a.m., you pray, and have your first injection, but you cannot manage the rest of the day, when to remember to have the injection. When we get busy, we forget.” (FG1)

Most participants said they led a normal life, though fasting during Ramadan was a concern. Most were not given clear medical advice on this issue, but the majority fasted and were led by their own health condition and feelings when it came to taking the medicines.

Social gatherings, funerals and weddings form a major part of the worries of diabetic patients. They considered being able to attend such commitments a vital part of their lives and felt that having to explain themselves continuously was a nuisance. Some participants also said that dealing with complications, including pain and not being able to climb stairs, interfered with their social lives.

“Maybe a funeral, a wedding, they invite you, you have to go.....yesterday I left at 7:30 in the morning, went to “Suwaiq”. I had to go because a colleague’s brother had passed away - it’s an obligation.” (FG2)

“It is a burden, no doubt. You have to take certain precautions, when you go for a social event, avoid some foods. We have a habit as Omanis, you are served dates and sweets, and you have to give excuses, I’m sick, I cannot and such. It is a burden, there’s no doubt it’s a burden.” (FG5)

- Energy and mobility

Pain, fatigue and other complications were commonly reported in all groups, including an inability to climb stairs. One woman described her mother’s situation:

“She can’t walk, so we got her a treadmill, but she can only use it for a few minutes and then she stops……Climbing stairs is the biggest problem for my mother… whenever we want to go to visit someone, the first thing she asks is what their stairs are like, because she can’t climb more than a few stairs…… If there are a lot of stairs, she won’t go.” (FG2)

“When I get the pain in my knees I can’t sit, I cannot sit at all, there’s no strength left in me” (FG1).

4.4.3. Validation of questionnaire items

- Access-31 questionnaire

To improve the readability of the questionnaire and to make it suitable for various circumstances, all questions in the first person (I) were changed to the second (you). Questions referring to “today” were also wherever possible altered to “usually”: *“I needed an appointment for this visit”* for example, was changed to *“Do you usually need an appointment for the health centre?”*.

Some questions were not clear to participants, and these were also modified, such as Q7 *“Does your doctor advise you about your health?”*, which became *“Does your doctor advise you about what worries you healthwise?”*. Similarly, Q13 *“If you needed to make an appointment for this visit, how long did you wait for this appointment?”* was changed to *“If you need to make an appointment, how long do you wait to get it?”*. In Q15 participants required clarification as regards the meaning of “referral” and “specialist” (in the Omani healthcare system a specialist might also be a nutritionist or physiotherapist), and so this question was changed to *“Were you referred to a consultant or physician specialist over the last 12 months?”*.

Study participants also requested the addition of two more questions: *“If you are unable to reach the health centre because of an injury or disability, do you know how to contact your*

GP and receive healthcare?” , and “ When you talk to your GP, does he explain your illness and respond to your questions in a manner that you are satisfied with?”.

4.5. Semi-structured interviews

I carried out the semi-structured interviews in order to ensure that the questionnaire items were understood as they were intended. A secondary objective was to explore diabetic patients’ experience of the disease and of health services in Oman, and to further explore the meaning of the phrase “access to primary healthcare” for Omanis.

4.5.1. Preparing and conducting the interviews

The interview participants were purposely selected from a range of income, education and social settings. Some participants were chosen by the contact person at one health centre in Muscat, while the rest were selected from high-income families who were exposed to both public and private healthcare. In Oman, it is common to seek a second opinion from private health sources either locally or abroad (Al-Hinai *et al.*, 2011), and therefore it was important to take this group into consideration.

Ten semi-structured interviews were conducted between 19 April and 15 May 2019. Before each interview, I or the contact person called each participant to invite them. Some interviews were held at the health centre and others at a coffee shop or my home, according to the participant’s convenience.

I started by greeting each participant and provided a brief description of the study, handing out the information sheet and obtaining consent to participate. The forms were similar to those used in the focus groups, with minor modifications. After an ice-breaking session, I asked an open-ended question about the meaning of “access to primary healthcare”. To aid the discussion, I used a guide, and I also recorded my impressions of the interview on a form. Half of the participants were males, and the average time since diagnosis was 10

years, ranging between 5 and 29 years. Six participants took pills and four used injectables. Only four of the participants reported their age, and these had a mean age of 39 years.

4.5.2. Access to healthcare

- **What does access to healthcare mean?**

When asked this question, only two participants had a response. To them, healthcare accessibility was associated with service availability. One participant explained it as being able to get to the health centre and find a parking space, waiting time, and being able to see the doctor and get tests done on time:

“So, access to healthcare for me is when you are, umm, your access to the place is good because usually, you would go, either scheduled or not scheduled. If you are going scheduled, then fine, If you’re not feeling well then access and waiting time and the ease of getting an appointment.....Yes, going to the place, parking your car, being able to get a slot, quickly, appointment, the waiting area is reasonable, clean, ehh. The staff is friendly. Then you know, meeting the doctor, and then afterwards if again if there are any tests that you need, so the tests are carried out in the same locality and I don’t have to go elsewhere. I am of my test results by email and the medications are available within the same building.” (P9)

- **Cultural acceptability**

The predominant emphasis here was on the attitude of the health workers and the service provided. Most participants were appreciative of the health centre staff:

“The doctor is very caring.” (P1)

“They are very cooperative; I mean the doctors... They understand, and they are considerate. When you have a question, they comfort you.” (P10)

“First of all, they treat you well.” (P4)

Although a minority did express some concerns about attitude:

“They should treat the patient well, what kind of treatment is this? For example, the doctor should greet the patient warmly. This makes you relaxed.” (P8)

- Organisational access

Accessibility by phone and delay in appointments were recognised as important issues by participants:

“Its’ as if they get confused by something called a phone call, they don’t know what to do.”

(P10)

“There are delays in waiting for the doctor, you come at 10 and leave at 12.” (P5)

Some of the same issues with medicines that emerged in the focus groups were also mentioned:

“They gave me medicines that I couldn’t take...The quality was harmful to my stomach, I stopped taking them.” (P10)

“Imagine you’re sitting on marble for a long time, if you have a back problem or anything else it will get worse.” (P2)

- Availability of medicines and services

In general, this area was considered to be satisfactory, but a few participants did find the availability of medicines problematic:

“If I buy my medicines from the pharmacies, I don’t have to wait. Sometimes the health centre is too crowded, and the medicines are delayed.” (P5)

4.5.3. Living with Diabetes

- Accepting the diagnosis

Many participants described their feelings of shock, frustration, and denial when they received the results of their diagnosis:

“Of course, it started as a shock because I always perceived myself as someone who was healthy, taking care of myself, sort of... To find out at a later stage of my life, And hence it was a bit of shock, sadness, and it was a real blow to my ego.” (P9)

“At first, almost 10 years ago, when I was told by the health centre that I had (diabetes), I accepted it, but in reality I wasn’t accepting it, because, ... how can you tell me I am sick, maybe it (the sugar level) just went up at that moment... Even though I knew I was sick but deep down I was complacent... Unfortunately, it took a while...weeks, months, maybe a year...you can deny that you have the disease, and thinks OK, I can live as if I don’t have it...” (P3)

“It was a kind of denial. I won’t get it, maybe someone else in the family...but I am athletic, I do a lot of things.” (P5)

- Diabetes control

After the denial stage, participants talked about accepting, taking responsibility and gaining control. One participant described her experience:

“Then I had to collect myself and create a new lifestyle and deal with this matter.”
(P9)

Many participants believed that they were managing to live with diabetes well:

“Normal, I live my life normally. I go to weddings, funerals, trips, anything, thank God.”
(P1)

There were conflicting views, however, when participants spoke about diabetes control. A few participants said they had total control over the disease:

“No, not at all, I can control it completely, I even believe that I’ll someday be able to stop the medication if I continue the same lifestyle, exercise and good nutrition.” (P8)

On the other hand, some other participants mentioned a loss of control:

“I feel I’ve lost control...you try hard to control it, if you can’t eliminate it, at least control it.... but it (diabetes) beats you, you feel tired, you feel you’ve lost control, tired”

(P5).

All participants agreed that managing diabetes was their own responsibility. A typical response when asked how they dealt with diabetes was something like *“the diabetic patient is his own doctor; you’re responsible for it.”*. One participant blamed himself for not having followed medical advice since his diagnosis.

“I am educated, but when I talk about the disease, I find myself unqualified to take responsibility as a patient” (P3)

- Social Burden

All participants emphasised that diabetes was a burden in their daily life, social activities and religious commitments, with some also describing the disease as a hindrance to their everyday activities:

“Because of course, of these medications, multiple medicines, the readings, they limit your movement, they limit your exposure to people...It is a part-time job, something that takes away from your day, so I still have to wake up, I still have to, you know, check my readings, make sure I have a good reading before I leave home, I have a good reading before I drive, I have a good reading before I sit in a long meeting.” (P9)

“You feel socially uncomfortable; you can’t live with people.” (P3)

Dealing with social pressure was mentioned frequently:

“When I go to my mother’s house, she always says eat this, eat that, drink juice it’s only one glass, and so on...For me, it is very important to stay away from these things because they are harmful.” (P10)

“Sometimes you get embarrassed, (they ask you), do you have diabetes? These questions are not nice, I mean I have it, but even so, why do you interfere in my private issues? It gets to you (psychologically).” (P1)

“They serve you dates, and sweets and you have to make excuses. You say I can’t. I am sick....it is a burden no doubt” (P8)

Most participants, though, adapted to social pressure:

“When the sweet tray comes to me, I take a small portion, and with rice, I evaluate how much I should eat.” (P8)

“People started to get used to this, I mean without many questions, they used to ask, why and so on, but after that they even started to copy me” (P4)

As with the focus group participants, fasting in Ramadan was an issue for the interviewees, and the majority did fast, some against medical advice according to them.

- Complications and self-image

Complications have certainly affected participants’ quality of life. Some were also concerned about their appearance:

“Sometimes it does blur my eyes, especially if I’m having a hypo, it does sometimes blur my thinking.” (P9)

“The complications make my life suck. My stomach.... the doctor told me that insulin stores fat around the stomach. It’s very annoying” (P4).

“It did contribute to the way I look. You see the person who is sick, he is different from a healthy person... My body is changing in so many things” (P7).

“In the last few months, when I go to anywhere, (I hear) the word, “uncle” Uncle come, Uncle have a seat.....I am 40, (laughs)... ... It’s making me old; it’s making me tired all the time” (P3).

“Your body changes, even my husband is telling me “Your eyes are dull.”. I am sick, I know it is diabetes, I am always tired” (P7).

- Where did diabetes come from?

As with the focus group participants, most interviewees believed that diabetes was a test from “Allah”. A common response was “it is from Allah”, while a few attributed it to genetics and lifestyle.

“It is stress, too much sugar and food. Our food is not organized, we caused it to ourselves” (P6).

4.5.4. Validation of the questionnaire items

Most participants demonstrated an understanding identical to the intended meaning of the questions. They did, however, consistently ask what the number scales in the quality of life tool meant, and they suggested replacing this scale with words. For that reason, I proposed replacing the scale of 1-7 with the terms in Table 7, and confirmed the phrases scale after discussion with supervisors. However, I did not introduce the new scale into the questionnaire until after the issue had been confirmed by the participants in the pilot survey.

Table 7 Wording of HRQOL question items.

1	Wording for QOL affect	Wording for overall QOL	Wording for Severity of diabetes
1	Not affected at all	Lowest quality of life	Not severe at all
2	Negligible effect	Very low quality of life	Very low severity
3	Very low effect	Low quality of life	Low severity
4	Low effect	Medium quality of life	Moderate
5	Moderately affected	Good quality of life	Somewhat severe
6	High effect	Very good quality of life	Severe
7	Extremely affected	Best quality of life	Extremely severe

4.6. Summary

In this component of the study, the aim was to generate a survey tool that was understood by and culturally acceptable to the participants in a cross-sectional survey of access to healthcare and quality of life among type-2 diabetes patients in Oman. Another objective was to ensure that Access-29 covered all aspects of access to primary healthcare from the patient perspective. To that end, I used the tools generated from the literature review, starting with the translation and cultural adaptation of both Access-29 and Diabetes-39. In the course of the focus group discussions, the face and content validity of Access-29 and Diabetes-39 were assessed and two questions added to the former. The resultant Access-31 was then used in the semi-structured interviews to further ensure that the tool was fully comprehensive and well understood by the participants. The validated tools were then used in the cross-sectional survey.

4.6.1. Translation and cultural adaptation

The focus of the translation was on developing a simple tool that the Omani layperson could understand, and with that in mind amendments were with a view to adapting the text to local colloquial language. Khader *et al.* (2008) carried out a similar exercise for Diabetes-39 in Jordan, but because of the difference in the colloquial Arabic used in the two countries, I was not able to determine that the Jordanian version was valid for Oman, and so I undertook a complete translation and cultural adaptation from the original English tool. Afterwards, I found the two Arabic versions to be comparable, except for a few differences in the wording, mostly in relation to how Omanis understood certain terms such as “limitations”, and their perception of sexual behaviour. In Khader’s study, the percentage of illiteracy was 41%, compared to 40% in this study, and therefore education is unlikely to be a cause for this variation in understanding the questions: the more likely interpretation is that it is down to linguistic differences between the two countries.

In the case of the Access-29 tool, the translation standardised how the questions were formed. Because the tool is a compilation of questions from several sources, the language and phrasing were inconsistent, and some questions assumed that the interview took place at the health centre. Wherever necessary, I added the terms “regularly” or “over the last year”, and I also chose to use the second person “you” at all times. An online survey was planned, and so it was necessary to generate a tool that could be valid for use at home or at any other location.

Some questions included terms that were inconsistent with the health system in Oman. For example, “GP” is not commonly used as a label for doctors, and “specialist” implies only specialist physician. All relevant terms were thus changed to improve clarity and consistency, and to adapt the tool to the local context and the respondent’s understanding.

4.6.2. Focus groups

In the focus group discussions, the participants expressed the view that primary healthcare accessibility meant not only being able to reach the health centre but also to get timely healthcare once they arrived. Delay and referral in appointments was a common theme, and the availability of services and medicines was also mentioned.

Participants considered access to information to be an important element of accessibility, believing that this should include informing patients about appointment times, providing education on how to stay healthy and manage the disease, and ensuring access to medical records in a language they could understand. They also emphasised that test results should be communicated to patients in a timely manner.

It is apparent that focus group participants recognised geographic access, access to information, organisational access, cultural acceptability and the availability of services and medicines. All of these domains were identified in the concept review of access in Chapter 2.

Affordability, on the other hand, did not emerge in the discussions. This may be attributable to the relatively high income of the citizens of Oman, or to the fact that health services are provided to all Omanis free of charge. A free health service is not offered to non-Omanis residing in the country, though, and this group constitutes more than 40% of the population. For them, affordability may indeed be an issue of concern.

With regard to living with diabetes, the participants showed strong commitment and expressed their ability to cope with the disease even in stressful situations. In Oman, attending social activities such as weddings, funerals and family gatherings acts as a strong social identifier, and for this reason this was considered a challenge to the patient's commitment to a healthy lifestyle, as well as being a burden for individuals suffering fatigue and other complications.

When discussing quality of life, the issues raised by the focus group participants were mostly consistent with Diabetes-39 domains, namely diabetes control, anxiety and worry, social burden and sexual function, as well as energy and mobility.

Sexual function was not discussed in the focus groups. Because of the conservative nature of Omani society, and perhaps also because of my own status as a senior health official, which may have skewed the discussion, this issue was avoided in all groups. Although some alluded in passing to sexual function, they then chose to change the subject. One woman cracked a joke in embarrassment, and another covered her face and said that her husband was away. One man stated that *“we will not take up our time and other people’s time as well”*, explaining that he had felt differently when he was younger and then changing the subject. These observations indicate that there are aspects of sexual function that were not covered in the discussions.

4.6.3. Semi-structured interviews

Very few participants were willing to offer their own interpretation of access, and those who did covered several domains. It was clear that for them the meaning of “access to primary healthcare” went beyond distance and an ability to reach the health centre, and also included issues of service availability, communication and timeliness. Overall, the discussions confirmed the domains outlined in the “Access-31” questionnaire, i.e. geographical access, access to information, organisational access, cultural acceptability and the availability of services and medicines. Interview participants, like their focus group counterparts, did not mention affordability.

As far as organisational access was concerned, attitudes and treatment by medical staff were perceived to be important aspects of the healthcare experience in the interviews. Participants referred to health staff as cooperative, respectable, caring and knowledgeable.

When asked to comment on accessibility by phone, all participants said that it was not possible to contact the health centre by phone.

Interview participants were willing to share their feelings of shock and denial and body image concerns more than focus group participants, perhaps because of the intimate nature of the interview setting.

As regards quality of life, participants discussed issues related to diabetes control and anxiety and worry, as well as social burden. Energy and mobility did not seem to be topics of major importance for them, and like the focus groups, they avoided discussing sexual function.

In general, participants' concerns and experiences of diabetes were consistent with the Diabetes-39 questionnaire. Some of the issues that participants said had an impact on their quality of life were worries about passing diabetes to children, concerns about body image, and fasting during Ramadan.

Finally, changes were made to the study tool to improve the questionnaires' readability and comprehension. Focus groups confirmed the face validity of the questionnaire items and the interviews revealed that the changes made were satisfactory, and that the questions were understood by respondents in the way the researcher intended them to be.

In addition to improvements to the language of both Access-29 and Diabetes-39, two questions were added to Access-29:

“If you are unable to reach the health centre because of an injury or disability, do you know how to contact your GP and receive healthcare?”

“When you talk to your GP, does he explain your illness and responds to your questions in a manner that you are satisfied with?”

The first question was categorised under organisational access because participants viewed this as a component of provision of services, and the second question was discussed in the context of respect and was thus incorporated in the cultural acceptability domain.

Finally, the numeric scale in the quality of life tool was not clear to the participants, and the numbers were therefore replaced by wording representing the scale. This wording was agreed in discussions with the supervisors. The suggested replacements were implemented in the main survey only after ambiguity regarding the numeric scale was confirmed by the pilot study participants.

In summary, the qualitative study established the validity of Arabic versions of the two key instruments and demonstrated that these could be used with some confidence in a national sample survey of access to primary healthcare for type-2 diabetes patients in Oman.

Chapter 5. Cross-sectional Survey on access to primary healthcare among diabetes patients in Oman

In this chapter, I shall present the findings of a cross-sectional survey which examines access to healthcare and quality of life among type-2 diabetes patients attending primary health facilities in Oman.

The following section presents the pilot survey results, followed by a discussion of non-response and sample characteristics. In Sections 5.3 and 5.4, I discuss the survey findings pertaining to my first question “How accessible is healthcare in Oman?” I present the Access-31 domains and their coding scheme, and then explore some aspects concerning the validity and reliability of this instrument. Although it is not the aim of this thesis to validate Access-31, item reduction and internal consistency is explored as a first step for further validation in future research.

In section 5.4, I discuss variability in Access-31 and its individual domains among various governorates in Oman. In Section 5.5, I move on to explore the answer to the research question “What is the internal consistency of Diabetes-39 and how does this compare with other versions of the same tool?”, investigating variability in quality of life between various governorates. In Sections 5.6 and 5.7, I present data for Diabetes-39 HRQOL and glycated haemoglobin by governorate, while in Section 5.8 regression analysis is employed to examine the association between glycated haemoglobin (HbA1c), access to healthcare and quality of life.

5.1. Analysis of non-response bias

For sample size calculations, I produced a sampling frame of seven clusters from eleven administrative governorates. The clusters were based on similarities in culture, geography and ratio of PHC physicians (Chapter 3).

The contact individuals in participating health centres invited 1,876 patients to take part in the study, of whom 820 responded. The response rate was thus 43.7%. This figure was highest in Al-Sharqiah North (94.0%), followed by Ad-Dhakhliyah (78.9%) and Musandam (62.7%), and the lowest response rate was in Al-Buraymi (19.7%), Muscat (20.4%) and Al-Batinah North (22.3%). For the clusters, Ad-Dhakhliyah, Ash-Sharqiah and Musandam had response rates of 78.9%, 64.8% and 62.7% respectively, whereas Muscat, Al-Batinah and Adh-Dhahirah had the lowest response rates, at 20.4%, 22.3% and 25.4%. The response rates were significantly different between governorates as well as between clusters (P -value < 0.05) (Table 8).

The percentage of respondents with $HbA1c \geq 6.5\%$ was 73.2%, compared to 72.3% among non-respondents. The P -value of the χ^2 was 0.685, indicating that the percentage of patients with good glycated haemoglobin was not statistically significant between respondents and non-respondents.

Table 8 Profiles of respondents and non-respondents in the sample of the study on access to primary healthcare among diabetic patients in Oman

Governorate	Cluster	Respondents		Non-respondents		Total	P-value
		N	%	N	%		
Muscat	Muscat	55	20.4	214	79.6	269	$\chi^2=480.2$ P-value <0.05
Dhofar	Dhofar	83	31.1	184	68.9	267	
Musandam	Musandam	168	62.7	100	37.7	268	
	Adh-Dhahirah	68	25.3	201	74.7	269	
Al-Buraymi		27	19.7	110	80.3	137	
Adh-Dhahirah		41	31.1	91	68.9	132	
Ad-Dhakhliyah	Ad-Dhakhliyah	210	78.9	56	21.1	266	
Al-Batinah North	Al-Batinah	59	22.3	205	77.7	264	
	Ash-Sharqiah	177	64.8	96	35.2	273	
Ash-Sharqiah North		126	94.0	8	6.0	134	
Ash-Sharqiah South		51	36.7	88	63.3	139	
Total		820	43.7%	1056	56.2%	1876	
HbA1c	<6.5	212	26.8	281	27.7	493	$\chi^2=0.164$ P-value>0.5
	>=6.5	579	73.2	735	72.3	1314	
Total		791	43.8	1016	56.2	1807	

5.2. Characteristics of sample

The Ad-Dhakhliyah governorate/sampling cluster contributed 25.6% of the sample, while 20.5% were from Musandam. The smallest number was from Al-Buraymi (3.3%), followed by Adh-Dhahirah (5.0%). With regard to the sampling cluster, the smallest number of participants was from Al-Batinah.

The mean and median age of the participants in the study were 55.4 and 55.0 years respectively, and the standard deviation was 12.9 (Table 9). Respondent age ranged between 25 and 100. On visual inspection, the age distribution was skewed to the left, with the percentage of participants from the age categories 25-45, 46-55, 56-65 and over 65 24.85, 28.3%, 26.0% and 21.0% respectively (Table 10). There were also fewer males (23.3%), single people (23.3%) and non-Omanis (5.9%) than there were females, married people and Omani participants.

To assess the education level, I asked respondents about the number of years they had been enrolled in formal education (in Oman, some individuals are homeschooled as regards reading the Qur'an and writing). The education level reported was low, as 47.7% said they had not received any formal education, while 42.1% had received some schooling, ranging between 3 and 12 years, and only 10.2% had a university degree or higher. This is consistent with the findings of Alghafri *et al.* (2017a), who found that 49% of a random sample of type-2 diabetes patients attending primary healthcare facilities in Oman were not educated.

Cross-tabulation of education and age categories showed that the level of education declined with age. For participants who are <45 years old, only 11.3% reported having had no formal education, while the corresponding figure was 38.8%, 65.7% and 80.2% for the age groups 46-55, 56-65 and >65 respectively. Similarly, 23.2% of respondents from the age group <45 years old had been educated at least to a university level, compared to 11.2%, 4.2% and 1.2 % for the age groups 46-55, 56-65 and >65 (data not shown).

I also measured household size, which I defined as the number of individuals living in the same house. This included family members and domestic help, and the number ranged between 1 and 35, with a mean household size of 7.4 and a median of 7.0 individuals per house. The percentage of households with 0-4, 5-7, 8-10 and >10 members was 21.2%, 37.7%, 26.7% and 14.4% respectively. The mean (SD) for HbA1c was 7.87 % (2.01) and the median (IQR) was 7.30% (2.64) (Table 9).

Table 9 Descriptive statistics for age, household size and glycemic control in a sample of diabetic patients in Oman (2018)

Variable	N	Missing	Mean	SD	Median	IQR
Age (years)	820	0	55.41	12.86	55.00	18
HH size (Number of individuals in the household)	820	0	7.37	4.04	7.00	4
HbA1c (%)	808	12	7.87	2.07	7.30	2.64

In this study, I asked respondents to report household income category. Income categories were: 0-299, 300-499, 500-699, 700-999, 1000-1299, 1300-1599, 1600-1999 or $\geq 2000^7$ OMR per month. These were based on previous research by Al Farsi et al. (2014) who found that 63% of their study participants earned less than 500 OMR per month. About 17.9% of respondents said that their households earned less than 300 OMR per month, while 21.7%, 12.7%, 9.5%, 8.5%, 3.8%, 2.2% and 4.0% reported earning 300-499, 500-699, 700-999, 1000-1299, 1300-1599, 1600-1999 and ≥ 2000 OMR per month respectively.

⁷ OMR: Omani Rials. 1 Omani Rial = 2.60 US Dollars, 1.99 GBP (1 May 2019). (<https://www.xe.com>)

5.3. Overview of access to primary healthcare

In this section, I present respondents' answers to each question in Access-31 by domain, discussing how these were coded for further analysis for each domain.

Responses for most questions (N=25) were “Yes” or “No”, and the remaining ones had multiple answers. I recoded all questions to “1 = problem” or “0 = no problem”, where the “Problem/1” code indicates that this question response represents an obstacle to healthcare access. The responses in five multiple-answer questions were assigned 0 or 1 codes subjectively, based on consensus between myself and the supervisors. Jenkinson *et al.* (2002a) used “Problem” / “No Problem” binary coding for scoring the Picker patient experience questionnaire, and a comparable scoring system was also followed in the NHS patient survey (Care Quality Commission, 2019).

I chose a binary scale for the questions to simplify data management and analysis. There is an ongoing controversy with regards to the effects on the reliability and validity of research of using binary or multi-category responses. Compared to binary questions, respondents to multi-category questions showed a tendency to answer using certain scales independent of the actual content of the question, which could jeopardise the validity of the results, but nevertheless the results obtained from binary questions were similar to those of the multi-category questions (Dolnicar and Grün, 2007; Dolnicar, 2003). Some scholars suggest that more information is obtained with multi-response answers, but the reliability and validity of the questionnaires have been found to be similar when Likert or binary scales are used (Dolnicar and Leisch, 2012; Grassi *et al.*, 2007).

Table 10 Characteristics of a random sample of diabetic patients in Oman

Characteristic		N (%)	%	Total	Missing N (%)
Total		820	100	820	
Governorate	Cluster				
Muscat	Muscat	55	6.7		
Dhofar	Dhofar	83	10.1		
Musandam	Musandam	168	20.5		
	Adh-Dhahirah	68	8.2		
Al-Buraymi		26	3.2		
Adh-Dhahirah		42	5.0	820	0 (%)
Ad-Dhakhliyah	Ad-Dhakhliyah	210	25.6		
Al-Batinah North	Al Batinah	59	7.2		
	Ash-Sharqiah	177	21.6		
Ash-Sharqiah North		126	15.4		
Ash-Sharqiah South		51	6.2		
Age category					
<=45		203	24.8		
46-55		232	28.3		
56-65		213	26.0	820	0 (%)
>65		172	21.0		
Sex					
Male		344	42.0		
Female		476	58.0	820	0 (0)
Marital Status					
Married		629	76.7		
Single		191	23.3	820	0 (0)
Education					
No formal education		391	47.7		
Some education		345	42.1	820	0 (0)
University or higher		84	10.2		
Nationality					
Omani		772	94.1		
Non-Omani		48	5.9	820	0 (0)
Household size					

Characteristic	N (%)	%	Total	Missing N (%)
0-4	172	21.2	809	11 (1.3)
5-7	309	37.7		
8-10	210	26.7		
>10	118	14.4		
Household income				
<300	147	17.9	659	161 (19.6)
300-499	178	28.7		
500-999	182	22.2		
>=1000	152	18..5		

5.3.1. Geographical access

This domain consists of three questions: 1) “How long does it usually take you to get to the health centre?”; 2) “In the last 12 months did you cancel or delay a visit to the health centre because you had no transport?”; and 3) “In the past 12 months, did you cancel or delay a visit to the health centre because you could not afford transport?” (Table 11).

When scoring the questions of this domain, Q1 (Table 11) was not included in the score as it does not provide any information on accessibility. For this domain, the aim was to find out whether the primary healthcare facility was within a reachable distance for the patient, and as such the specific mode of transport is not an important factor.

The dummy coding was as follows: 0 = no problem, 1 = problem. For Q2, 0-30 was coded as 0, and the two categories 30-60 and >60m coded as 1. In Oman, more than 95% of the population live within five miles of a health centre, and according to this study, the mode of transport for more than 94% was a car (Oxford Business Group, 2019), and I therefore assumed that most respondents should be able to reach a health centre within 30 minutes. For Q2 and Q3, I coded Yes = 1 and No = 0.

Table 11 Responses to questions in Domain 1 “Geographical Access” in Access-31 for a random sample of diabetic patients in Oman

	Question	Response	Code	N	%	Total	Missing N (%)
Q1	How did you commute to the health centre/facility?	Car		777	94.8		
		Walking		27	3.3	820	0
		Others		16	1.9		
Q2	How long does it usually take you to get to the health centre?	0-30 m	0	755	92.1		
		30-60 m	1	54	6.6	820	0
		>60 m	1	11	1.4		
Q3	In the past 12 months, did you cancel or delay a visit to the health centre because you had no transport?	Yes	1	183	22.3		
		No	0	637	77.7	820	0
Q4	In the past 12 months, did you cancel or delay a visit to the health centre because you could not afford the cost of transport?	Yes	1	47	5.7		
		No	0	773	94.3	820	0
	Total						

5.3.2. Access to information

This domain consisted of five questions, all of which had Yes/No answers. For all questions, the code was 0 for Yes, and 1 for No. The largest percentage for problems with access to information was the question “Does your doctor or healthcare facility call to inform you about your test results?” to which 77.2 % responded “No”, whereas the lowest percentage of “No” answers was 5.7% for the question “Did you get advice from the health centre on how to stay healthy?”

Table 12 Responses to questions in Domain 2 “Access to information” in Access-3I for a random sample of diabetic patients in Oman

Question	Response	Code	N	%	Total	Missing N (%)
Q5 Does your doctor/healthcare facility call to inform you about your test results?	Yes	0	187	22.8	820	0 (0)
	No	1	633	77.2		
Q6 Did you get advice from the health centre/practitioner about how to stay healthy?	Yes	0	773	94.3	820	0 (0)
	No	1	47	5.7		
Q7 Does your doctor advise you about your health concerns?	Yes	0	731	89.1	820	0 (0)
	No	1	89	10.9		
Q8 If you call your health facility for questions during office hours do you get an answer on the same day?	Yes	0	700	85.4	820	0 (0)
	No	1	120	14.6		
Q9 If you call your health facility for questions after working hours do you get answers on the same day?	Yes	0	460	56.1	820	0 (0)
	No	1	360	43.9		

5.3.3. Organisational access

This consisted of eight questions (Table 13). The purpose of Q12 and Q15 was to screen respondents who were eligible to answer the following questions (Q13 and Q16), and therefore, Q12 and Q15 were removed from the analysis.

To be included in a questionnaire score, an item should also be applicable to as many respondents as possible. Pesudovs *et al.* (2007) suggest that each question items should have at least 50% valid responses, and as Q10 and Q17 were not applicable to 63% and 70% of the respondents respectively, the two questions were dropped from the scoring and analysis (Jenkinson *et al.*, 2002a; Pesudovs *et al.*, 2007).

For Q13 “How long do you wait for an appointment?” the response was coded to 0 if the waiting time reported was < 7 days, and to 1 if the waiting time reported was 7-30 days. For Q14, the cut-off point for waiting time to see a GP at a health centre was one hour, and

for Q16, the cut-off for waiting time for an appointment with a specialist was one month. These were both based on personal judgement of acceptable waiting periods.

With regard to appointments, an alarming 43.3% of the respondents reported that they did not know how to arrange evening, night and weekend appointments. 61.3% stated that they needed an appointment to see a GP, and out of those 159 (31.6%) reported getting an appointment in 1-2 days, 101 (20.07%) reported 3-7 days, 124 (24.65%) reported 7-30 days, and 119 (23.65%) reported waiting for an appointment for more than a month. As regards appointments with specialists, 60.7% said that they had been referred to a specialist in the last 12 months, with a waiting time for the appointment of 1-2 days for 35.5% of respondents, 3-7 days for 19.5%, 7-30 days for 23.7%, and more than a month for 21.3%.

The reported waiting time at the clinic was less than 15 minutes for 156 (19.0%), 15-29 minutes for 240 (29.3%), 30-60 minutes for 278 (33.9%) and more than an hour for 146 (17.8%) of the respondents. Only 30% of the respondents reported needing care after suffering an injury, and out of these 46.6 % said they did not know how to contact a GP.

The score for organisational access as a whole ranged between 0 and 4, and the overall percentage for a 0 score was 38.8%, whereas 31.1%, 19.3%, 9.8%, and 1% scored 1, 2, 3 and 4 respectively.

Table 13 Responses to questions in Domain 3 “Organisational Access” in Access-31 for a random sample of diabetic patients in Oman

Question	Response	Code	N	%	Total	Missing N (%)
Q10 When you call your GP, how long does it take to talk to someone?	0-10 m		143	17.4	820	0 (0)
	10-30 m		105	12.8		
	30-60 m		5	0.6		
	>one hour		10	1.2		
	No answer		38	4.6		
	I never tried to call	(NA)	519	63.3		
Q11 Do you know how to get evening, night and weekend appointments?	Yes	0	465	56.7	820	0 (0)
	No	1	355	43.3		
Q12 In general, do you need an appointment to visit the primary healthcare centre?	Yes		503	61.3	820	0 (0)
	No		317	38.7		
Q13 If you need to make an appointment, how long do you wait to get it?	1-2 days	0	159	19.4	820	0 (0)
	3-7 days	0	101	12.3		
	7-30 days	1	124	15.1		
	More than a month	1	119	14.5		
	I do not need	0	317	38.7		
Q14 The last time you visited the health centre, how long did you wait to see a doctor?	Less than 15 m	0	156	19.0	820	0 (0)
	15-29 m	0	240	29.3		
	30-60 m	0	278	33.9		
	More than one hour	1	146	17.8		
Q15 Were you referred to a specialist/consultant doctor or a specialist within the same health facility or to a hospital during the last 12 months?	Yes		498	60.7	820	0 (0)
	No		322	39.3		
Q16 If yes, how long did you have to wait for the appointment with the specialist?	1-2 days	0	177	35.5	498	322 (39.3)
	3-7 days	0	97	19.5		
	7-30 days	0	118	23.7		
	>a month	1	106	21.3		
Q17 If you are unable to reach the health centre because of an injury or disability, do you know how to contact your GP and receive healthcare?	Yes		132	16.1	820	0 (0)
	No		115	14.0		
	Not applicable		573	69.9		

5.3.4. Affordability

This consisted of two questions, which were coded 1 for Yes and 0 for No. The percentage of respondents who responded Yes to Q18 and Q19 was 3.8%, and 2.4% respectively. The score range was 0-2. Overall, 95.1% of the respondents scored 0, 3.8% scored 1 and 1.1% scored 2. In Oman, healthcare is free of charge for all Omanis, and the World Bank reports that in 2016 out of pocket expenditure⁸ represented only 5.9% of health expenditure (World Bank Group, 2019).

Table 14 Responses to questions in Domain 4 “Affordability” in Access-31 for a random sample of diabetic patients in Oman

	Question	Response	Code	N	%	Total	Missing N (%)
Q18	In the past 12 months, did you postpone or abstain from a visit because you could not afford it?	Yes	1	31	3.8	819	
		No	0	788	96.2		1 (0.1)
Q19	In the past 12 months, was there a time you did not take a medication because you could not afford it?	Yes	1	20	2.4	790	
		No	0	770	97.5		30 (3.7)

5.3.5. Cultural Acceptability

This domain consisted of six questions, investigating communication, information, privacy and respect in patient experience at the health centre (Table 15).

For Q20, Q22, Q23 and Q25 the codes were 0 for Yes and 1 for No, whereas for Q21 and Q24 the codes were 0 for No and 1 for Yes. The highest negative response in this domain

⁸ Out-of-pocket payments (OOPs) are defined as direct payments made by individuals to healthcare providers at the time of service use (World Health Organization. 2019. *Health financing* [Online]. Geneva-Switzerland. Available: https://www.who.int/health_financing/topics/financial-protection/out-of-pocket-payments/en/ [Accessed October 27, 2019].

was 19.0% for patients not receiving information about their illness, and the lowest was 1.3% for respondents who said the doctor did not speak to them in a language they understood.

Table 15 Responses to questions in Domain 5 “Cultural Acceptability” in Access-31 for a random sample of diabetic patients in Oman

	Question	Response	Code	N	%	Total	Missing N (%)
Q20	Does your doctor talk to you in a language that you understand?	Yes	0	808	98.7	819	1 (0.1)
		No	1	11	1.3		
Q21	In the past, did you have difficulty understanding your doctor or healthcare professional?	Yes	1	82	10.0	819	1 (0.10)
		No	0	737	89.9		
Q22	Have you received written or other information about your illness?	Yes	0	663	81.0	819	1 (0.1)
		No	1	156	19.0		
Q23	When you are discussing your health conditions or concerns with the GP or healthcare provider, is it always in an area where you have privacy, a private room for example?	Yes	0	727	88.8	819	1 (0.1)
		No	1	92	11.2		
Q24	In the past 12 months, have you ever been treated with disrespect during your visit to the health centre?	Yes	1	47	5.7	819	1 (0.1)
		No	0	772	94.1		
Q25	When you talk to your GP, does he explain your illness and respond to your questions in a manner that you are satisfied with?	Yes	0	800	97.6	819	1 (0.1)
		No	1	19	2.3		

5.3.6. Availability of services and medicines

This domain consisted of six items (Table 16). Q26, Q27, Q29 and Q30 were coded 0 for Yes, and 1 for No, while Q28 and Q31 was coded 0 for No and 1 for Yes.

For Q27, on having a regular source of care, almost 30% of the respondents reported not having a health centre, personal GP or doctor to consult. The health system in Oman relies heavily on PHC as a patient gateway, and the study participants were approached through their respective health centres. One interpretation for the high percentage claiming

no regular source of care is that there is a lack of appropriate public awareness of primary care services. Almost 97%, on the other hand, reported that blood tests they were asked to take were available.

Table 16 Responses to questions in Domain 6 “Availability of services and medicines” in Access-31 for a random sample of diabetic patients in Oman

Question	Answer	Code	N	%	Total	Missing N (%)
Q26 In the past 12 months has a doctor talked to you about the medications you take, including ones prescribed by your doctor?	Yes	0	781	95.4	819	1 (0.1)
	No	1	38	4.6		
Q27 Do you have a health centre or a personal GP or doctor that you consult?	Yes	0	573	70.3	815	5 (0.6)
	No	1	242	29.7		
Q28 During the last year, were you prescribed a medicine that you did not receive?	Yes	1	109	13.3	819	1 (0.1)
	No	0	710	86.7		
Q29 If the doctor asks you to do a blood or other test, is it always available at the health centre or another institution?	Yes	0	775	96.9	800	20 (2.4)
	No	1	25	3.1		
Q30 If you need to see a dietitian, physiotherapist or another health professional, are they always available?	Yes	0	549	85.9	639	181 (22.1)
	No	1	90	14.1		
Q31 During the last year, have you had difficulty receiving medical treatment because there was no doctor or another health professional available?	Yes	1	52	6.4	815	5 (0.6)
	No	0	763	93.6		

5.3.7. Descriptive statistics for Access-31

As indicated in the previous section, for each item “No problem” was scored to 0, and “Problem” to 1. The score for each domain was the sum of scores for the individual questions, and the range of scores was 0-3 for geographical access, 0-5 for access to information, 0-4 for organisational access, 0-2 for affordability, 0-6 for cultural acceptability and 0-5 for availability of services and medicines.

The highest percentage of respondents reporting no problem for all the questions in a domain (score=0) was 91.6% for affordability. This is consistent with previous evidence, and

the World Health Organization states that the percentage of the population that spent more than 10% of their income on health is <3% in Oman (WHO, 2017).

The domain which ranked second was geographical accessibility for which 71.7% reported “No problem” (score 0). The most problematic domain, on the other hand, was access to information, where only 16.8% reported no problem. The percentage of respondents who scored 0 for organisational access and availability of services and medicines was comparable, at 38.8% and 39.5% respectively (Table 17).

Reflective constructs in which various domains are composed of internally consistent measures is widely used for developing patient questionnaires, while formative constructs that do not assume associations between its individual items are less common. Formative constructs are a good alternative, however, when the construct is composed of unrelated elements. One example is socio-economic status, which is composed of education and income among other factors that are independent from each other, but each one of those factors is important for the socio-economic construct (Diamantopoulos and Winklhofer, 2001). I consider access to healthcare a formative construct in which each domain is important but where individual domains are not necessarily related to each other, and I have used equal weighting to develop a composite Access-31 score from individual domains (Shwartz *et al.*, 2015).

To obtain a composite Access-31 score, I added up the scores of all domains, which generated 397 valid observations. The mean for the overall access sum was 3.5, with a median of 3 (data not shown). The maximum score was 14, with one respondent reporting having had 14 problems (0.3%). It was found that 8.3% of respondents had a score of 0, indicating no problem with any of the access domain questions, while for the scores of 1, 2, 3, 4 and 5 the percentage of respondents were 15.9%, 12.6%, 14.1%, 17.6% and 11.6% respectively (Figure 7).

Table 17 Scores for Access-31 domains in a survey sample of diabetic patients in Oman

Geographical access				Affordability (Aff)			
Number of problems	N	%		Number of problems	N	%	
0	588	71.7		0	751	95.2	
1	182	22.2		1	30	3.8	
2	37	4.5		2	9	1.1	
3	13	1.6					
Total	820	100		Total	790	100	
Missing	0	0		Missing	30	3.6	
Access to information (AI)				Cultural acceptability (CA)			
Number of problems	N	%		Number of problems	N	%	
0	138	16.8		0	527	64.3	
1	269	32.8		1	211	25.8	
2	286	34.9		2	63	7.7	
3	106	12.9		3	7	0.9	
4	15	1.8		4	8	1.0	
5	6	0.7		5	1	0.1	
				6	2	0.2	
Total	820	100		Total	819	100	
Missing	0	0		Missing	1	0.1	
Organisational access (OA)				Availability of services and medicines (SMA)			
Number of problems	N	%		Number of problems	N	%	
0	193	38.8		0	324	52.2	
1	155	31.1		1	212	34.1	
2	96	19.3		2	61	9.8	
3	49	9.8		3	21	3.4	
4	5	1.0		4	2	0.3	
				5	1	0.2	
Total	498	100		Total	621	100	
Missing	322	39.3		Missing	199	24.3	

5.4. Item reduction and reliability of Access-31:

Survey questionnaires should be as brief as possible, with irrelevant or redundant items removed. Factor analysis is commonly used to understand the underlying structure of items, clustering them into factors and deleting irrelevant items, and this is especially useful to shorten long questionnaires (Ismail, 2008; Boateng *et al.*, 2018).

I chose not to use factor analysis because the number of questions in Access-31 was relatively low, and at the same time they measure a wide range of components. For any given domain, it would be difficult to remove an item without risking the loss of some information. One feature of factor analysis is that it detects the underlying pattern of statistically-related variables. In my view, variables within one domain of Access-31 are not necessarily correlated as would be the case with clinical symptoms of a disease, for example, where a person experiencing one symptom is likely to experience others. It is my view that each domain would be composed of several items that may or may be not independent, but together all those items constitute that domain (Goodwin and Goodwin, 1991). In addition, for confirmatory factor analysis, Boateng *et al.* (2018) recommend using two independent samples, or the same sample in two waves of data collection, and in this research the sample required for such analysis is not available. For these reasons, I decided not to use factor analysis for item reduction in Access-31.

Another method used for item reduction is correlation analysis (Verho and Arnetz, 2003; Boateng *et al.*, 2018), where correlation matrices are generated against question items for each total domain in Access-31. For a group of items to measure the same construct Rattray and Jones (2007) stipulate that inter-item correlations of >0.8 indicate redundancy and that correlations between each item and the domain should not be <0.3 , or the question should be removed because it does not measure that domain. The inter-item and total item

correlation matrices of all the domains were within the range specified and none of the items were deleted on the basis of this analysis (analysis not shown).

The inter-item correlation of the domains was also calculated, with the sum score of each domain considered as an item and the access composite as a total measure. Between domain coefficients were less than 0.5, which indicates a weak association between individual domains (Table 18).

One interpretation of the low inter-domain correlation coefficients is that they do not measure the same concept. For example, geographical access is concerned with the patient's ability to reach the service, and this is mostly related to the distribution of services and infrastructure factors such as roads and transport. Access to information investigates how the primary healthcare service provides the patient with information on their health status, medical condition, etc., while organisational access studies the likelihood of a patient receiving a service once they reach the healthcare facility, which is influenced by several system components such as staffing and patient flow within the health facility. Affordability, meanwhile, asks whether the cost of the health service is within the patient's purchasing power, which is dependent on several socio-economic and system factors, such as whether the cost of the health service, if any, is within the limits of the patient's budget. Cultural acceptability, on the other hand, is concerned with whether the system-patient interaction is compatible with the patient's values and expectations, and finally, availability of services and medicines simply asks whether the service is accessible to the patient during their visit to the PHC service.

The highest associations were between organisational access and access to information (0.43), both of which are related to system delivery factors, and the second highest coefficient was 0.32, between geographical access and affordability. All of the coefficients, though, were below 0.5, and the correlation between overall access and each

domain ranged between 0.34 for affordability and 0.78 for cultural acceptability, indicating that all domains play a role in explaining overall access.

The domains of Access-31 explore access to primary healthcare from a patient perspective, with emphasis on the interaction between patient and system, though each domain explores a different angle. The domains might be considered mutually exclusive, and it is argued that as a whole they are sufficiently comprehensive. The construct validity of each domain was investigated in terms of concept analysis in Chapter 2 and patient perspective in Chapter 4, and both of these indicate that each domain is a necessary component for the overall understanding of access.

To answer the second research question mentioned in Section 3.3.1, I assessed the internal consistency of Access-31 using KR-20, which measures the degree to which dichotomous items Access-31 are correlated with each other. KR-20 ranges from 0-1, with higher values indicating that the items are measuring the same construct, which corresponds to better internal consistency. The cut-off point for KR-20 seems to be disputed, with some authors maintaining that a reliable tool should have a KR-20 value of more than 0.8, while others argue that a range of 0.6-0.7 is acceptable (Allen, 2017; Ursachi *et al.*, 2015).

I calculated the KR-20 values for each domain and for all items in Access-31. KR-20 was 0.248 for availability of services and medicines, indicating poor reliability for this domain. Geographical access, access to information, organisational access, affordability and cultural acceptability had KR-20 values of 0.416, 0.413, 0.401, 0.526 and 0.423 respectively, and these are considered to be unacceptable or poor. On the other hand, all items were combined in one construct the KR-20 value rose up to 0.625, indicating acceptable reliability (Table 19).

In Access-31, the domains define the factors, i.e. each domain is composed of a subset of elements that were constructed based on evidence, all of which are important but not

necessarily correlated with each other, as mentioned earlier. David *et al.* (2015) argue that, in such circumstances, establishing internal consistency is not only superfluous but also inappropriate, given that each item is inherently important to the construct of interest. I believe this to be the case for healthcare accessibility. In addition, the high KR-20 value observed for all items is a result of the increased number of items and not of improved reliability.

Table 18 Spearman correlation matrix of scores for Access-31 domains in a random sample of diabetic patients in Oman

		Geographic al access	Access to information	Organisationa l access	Affordability	Cultural acceptability	Availability of services and medicines
Geographical access	Correlation Coefficient N Missing (%)	1 820 0					
Access to information	Correlation Coefficient N Missing (%)	0.05 820 0	1 820 0				
Organisational access	Correlation Coefficient N Missing (%)	0.08 498 322 (39.3)	0.43* 498 322 (39.3)	1 72 784 (91.2)			
Affordability	Correlation Coefficient N Missing (%)	0.32* 790 30 (3.6)	-0.02 790 30 (3.6)	0.00 482 322 (39.3)	1 790 30 (3.6)		
Cultural acceptability	Correlation Coefficient N Missing (%)	0.17* 819 1 (0.1)	0.22* 819 1 (0.1)	0.17* 497 323 (39.4)	0.16* 790 30 (3.6)	1 819 1 (0.1)	
Availability of services and medicines	Correlation Coefficient N Missing (%)	0.17* 621 199 (24.3)	0.25* 621 199 (24.3)	0.28* 402 418 (51.0)	0.22* 609 211 (25.7)	0.42* 621 199 (24.3)	1 621 199 (24.3)
Total Access	Correlation coefficient N Missing (%)	0.37* 58 762 (92.9)	0.74* 58 762 (92.9)	0.69* 58 762 (92.9)	0.34* 58 762 (92.9)	0.78* 58 762 (92.9)	0.75* 58 762 (92.9)

* Statistically significant (P value < 0.05)

Table 19 Descriptive statistics and KR-20 of overall Access-31 and its domains

	Geographic al Access	Access to information	Organisational access	Affordability	Cultural acceptability	Availability of services and medicines	Access-31
Mean	0.120	1.52	1.03	0.07	0.49	0.66	3.55
Std. Deviation	0.65	1.02	1.03	0.28	0.82	0.83	2.44
Number of items	3	5	4	2	6	6	26
N	820	820	498	790	819	621	397
Missing (%)	0(0)	0 (0)	322 (39.3)	30 (3.6)	1 (0.1)	199 (24.3)	423 (51.6)
KR-20	0.416	0.413	0.401	0.526	0.423	0.248	0.625

5.5. Geographical variations in access to primary healthcare

Domain scores were ordinal with the number of values ranging from 3-7, and they did not conform to the assumptions of normality required for linear regression. When transformed into a logarithmic scale, the variables did not follow a normal distribution, and because of this each variable was truncated to 0.1 binomial categories. In this section I shall examine Access-31 by governorate.

5.5.1. Access-31 domains and governorate

Geographical access was significantly different between governorates. The highest percentage of respondents reporting inadequate geographical access was in Al-Buraymi at 51.9%, followed by Al-Batinah South at 45.8%, whereas the lowest percentage was observed in Adh-Dhahirah, which reported 9.8% (Table 20).

In general access to information was the most problematic issue, and this also brought up statistically significant differences between governorates. The governorates with the most

problematic access to information were Ad-Dhakhliyah and Ash-Sharqiah North at 96.7% and 96.0 % respectively, and the lowest percentage reported was 47.0% in Dhofar (Table 20). The percentages of respondents reporting inadequate organisational access were variable, with the highest being 92.6% in Ad-Dhakhliyah and the lowest 13.6% in Musandam.

Affordability was the domain with the highest percentage of respondents reporting adequate access (95.1%), but this was also significantly different between governorates, with Al-Buraymi showing the highest percentage of respondents with inadequate access at 26.9%, compared to 0% in Ash-Sharqiyah North. Inadequate cultural acceptability, on the other hand, showed an overall percentage of 35.7%, with the lowest rate in Ad-Dhakhliyah (23.85%) and the highest in Al-Batinah North at 62.7%. Finally, the overall percentage for inadequate availability of services and medicines was found to be 47.8%, and the highest rate observed was in Dhofar at 72.2%, and the lowest in Musandam at 26.8%.

Table 20 Percentage of respondents reporting problems for Access-31 domains in a sample of diabetes patients in Oman

	GA	AI	OA	Aff	CA	SMA
	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)
Governorate						
Muscat	15 (27.3)	48 (87.3)	26 (78.8)	5 (10.6)	31 (57.4)	25 (62.5)
Dhofar	37 (44.8)	39 (47.0)	27 (58.7)	7 (8.8)	24 (28.9)	39 (72.2)
Musandam	25(14.9)	116 (69.0)	17 (13.6)	3 (1.9)	55 (32.7)	37 (26.8)
Al-Buraymi	14 (51.9)	25 (92.6)	11 (73.3)	7 (26.9)	12 (44.4)	10 (58.8)
Ad-Dhakhliyah	65 (31.0)	203 (96.7)	88 (92.6)	8 (3.9)	50 (23.8)	78 (50.6)
Al-Batinah North	27 (45.8)	53 (89.8)	22 (73.3)	4 (6.9)	37 (62.7)	28 (71.8)
Ash-Sharqiah North	27 (21.4)	121 (96.0)	89 (75.4)	0 (0)	34 (27.0)	48 (39.0)
Ash-Sharqiah South	18 (35.3)	43 (84.3)	16 (88.9)	3 (6.5)	31 (60.8)	17 (63.0)
Adh-Dhahirah	4 (9.8)	34 (82.9)	9 (50.0)	2 (5.0)	18 (43.9)	15 (51.7)
Total	232 (28.3)	682 (83.2)	305 (61.2)	39 (4.9)	292 (35.7)	297 (47.8)
χ^2	53.9	148.1	182.9	43.4	65.4	57.5
P-value	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Respondents N	820	820	498	790	819	621
Missing (%)	0	0	322 (39.3)	30 (3.6)	1 (0.1)	199 (24.3)

GA = Geographical access, AI = Access to information, OA = Organisational access, Aff=Affordability, CA = Cultural acceptability, SMA = Availability of services and medicines

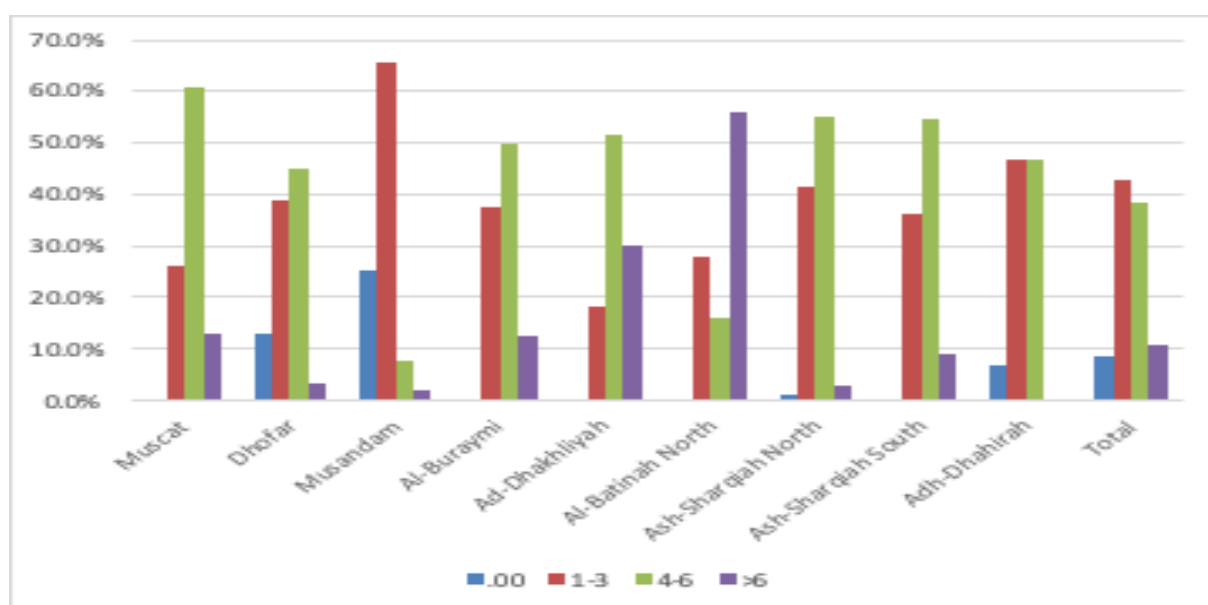
5.5.2. Access-31 composite scores and governorate

Because the sum of scores for Access-31 domains was skewed and not possible to analyse using parametric methods. I therefore created an ordinal variable in which the sum was categorised into 0, 1, 2 and 3 codes. The code 0 indicates no problems with access in any of the domains, and if the respondent reported 1-3 problems this was coded as 1, whereas 4-6 and more than 6 problems were coded as 2 and 3 respectively.

Analysis of the resultant variable showed significant variations between governorates. The highest score for access across all domains was observed in Musandam, where 25% of the respondents reported a '0' for every question. In Dhofar and Adh-Dhahirah, the rate for

adequate access was 12.9% and 6.7% respectively. The highest percentage for 1-3 problems was in Musandam (65.7%) and the lowest in Ad-Dhakhliyah (18.3%), while the highest rate for 4-6 problems was observed in Muscat at 60.9%, and the highest level for >6 problems was in Al-Batinah North, with 56.0%. These differences were statistically significant given that the chi-square statistic was 212.842 and the P-value was <0.05.

Figure 7 Categories of composite Access-31 score by governorate in a random sample of type-2 diabetic patients in Oman



5.6. Descriptive statistics and reliability of quality of life

Table 19 shows the descriptive statistics for Diabetes-39 HRQOL. For the domains of diabetes control, anxiety and worry, social burden, sexual function and energy and mobility, higher scores indicate a lower quality of life. A multicentre study in seven countries from Europe and Asia reported means of 37.2 for energy and mobility, 33.2 for diabetes control, 44.7 for anxiety and worry, 21.9 for social burden and 31.5 for sexual function (Lamu *et al.*, 2018). Chen *et al.* (2015) found, meanwhile, that the means for Diabetes-39 domains in a sample of diabetes patients from Australia, USA, UK, Canada, Norway and Germany were 35.92 (± 18.99) for diabetes control, 48.46 (± 23.00) for energy and mobility, 11.58 (± 7.26) for social burden, 15.17 (± 7.82) for anxiety and worry and 8.67 (± 5.79) for sexual

function. The findings of my survey are thus comparable with the data from Europe and Asia, though patients from Australia, USA and Canada appear to show better quality of life in the areas of anxiety and worry, social burden and sexual function.

For the cross-cultural adaptation of the Diabetes-39 and Access-31 questionnaires, I followed Beaton *et al.* (2000). The process included a number of steps to ensure the equivalence of the original and the translated instruments. Translation and qualitative validation are not, however, sufficient to ensure reliability of the instrument, and so an internal consistency test is required to ensure that the translated version is comparable to the original document.

Reliability analysis was run in SPSS to calculate Cronbach's alpha. Table 19 below shows that all the items have a Cronbach's alpha of >0.8 , which indicates that the version culturally adapted for Oman exhibits comparable reliability to the original Diabetes-39 questionnaire and to the translation by Khader *et al.* (2008). These findings confirm the cross-cultural validity of Diabetes-39 (Mokkink *et al.*, 2010).

Table 21 Reliability statistics for Diabetes-39 in comparison to reliability of the original instrument and another Arabic translation

	Diabetes control	Anxiety and worry	Social burden	Sexual function	Energy and mobility	Severity of diabetes	Overall QOL
Mean	33.13	29.47	21.10	23.68	33.74	3.21	4.71
Std. Deviation	24.07	28.86	23.53	28.68	25.39	1.40	1.47
N	574	574	574	574	574	807	807
Missing (%)	246 (30)	246 (30)	246 (30)	246 (30)	246 (30)	13 (1.6)	13 (1.6)
Cronbach's alpha (Al-Asfoor 2020)	0.95	0.92	0.93	0.95	0.96		
Cronbach's alpha (Boyer and Earp, 1997)	0.91	0.82	0.80	0.93	0.93		
Cronbach's alpha (Khader <i>et al.</i> , 2008)	0.85	0.81	0.80	0.92	0.89		
Total item correlation	0.749	0.724	0.809	0.499	0.771		
Inter-item correlation range	0.668-0.708	0.355-0.747	0.478-0.747	0.355-0.533	0.533-0.704		

Uysal-Bozkir *et al.* (2013) found that cross-cultural adaptations for many tools lack the necessary psychometric analysis, and for the purposes of this research cultural adaptation is combined with assessment in order to ensure the internal consistency of Diabetes-39. There were, however, some psychometric measurements that were not measured, such as construct validity and reliability, as well as floor and ceiling effect (Terwee *et al.*, 2007).

5.7. Geographical variation on quality of life

This section investigates differences between governorates in relation to the Diabetes-39 questionnaire. One-way analysis of variance in SPSS was used, and then the significance of the differences of Diabetes-39 domains between governorates were tested, controlling for Access-31 domains and composite score independently for each model. The aim of this was

to answer the question of whether the variability between governorates in terms of quality of life can be explained by access to healthcare.

5.7.1. Quality of life and governorate

Given that there is no composite score as part of Diabetes-39, to explore quality of life and to understand whether there are significant differences between governorates, I chose to investigate individual domains to study differences between governorates. In Tables 21 and 22 the mean, median and standard deviation for various Diabetes-39 domains, diabetes severity and overall quality of life are presented by governorate. The questionnaire contained one item involving participants' ratings on a Likert scale of the severity of their own diabetes, and another concerning each participant's rating of their overall quality of life (Appendix 8).

All domains showed significantly different mean scores between governorates. Diabetes control had a mean score of 30.73, with Al-Buraymi showing the highest score (51.09), indicating that patients there reported that diabetes control (or a lack thereof) had a major effect on their quality of life, and Ad-Dhakhliyah the lowest (20.71). The mean score for the anxiety and worry domain, on the other hand, was 28.79, and here Al-Batinah North had the highest mean score at 52.22, and Ash-Sharqiah North the lowest at 15.53.

Social burden appeared to have the least effect on quality of life, with a mean score of 20.06, and a highest score of 37.19 in Al-Buraymi and a low of 12.19 in Ad-Dhakhliyah. For sexual function, the mean score was 23.45, and the governorate with the highest score was Al-Batinah North (40.49) and the lowest Dhofar (15.45). In the domain of energy and mobility, Al-Buraymi had the highest score (48.48), and Ash-Sharqiah North the lowest (23.32). The mean score for this domain was 29.14.

The mean score of self-reported severity of diabetes was 3.11, with an F-statistic of 2.21 (P-value=0.025), and this varied significantly between governorates. The highest-ranking governorates in this domain were Ash-Sharqiah North and Al-Buraymi for which the

scores were 3.59 and 3.58 respectively, while the lowest-ranked governorate was Muscat, at 2.78. As regards overall quality of life, the mean was 4.77, and this also differed significantly between governorates, with the highest score, indicating the best overall self-reported overall quality of life, in Ash-Sharqiah North (5.17), and the lowest in Al-Buraymi (3.95).

It may be observed that, although Ash-Sharqiah North respondents reported better levels of anxiety and worry, energy and mobility and overall quality of life, they also reported that their diabetes was the most severe.

Table 22 Descriptive statistics for Diabetes-39 domains in a sample of diabetic patients in Oman

Governorate (Cluster)	Diabetes Control			Anxiety and Worry			Social Burden			Sexual Functioning			Energy and Mobility		
	Mean	Media n	SD	Mean	Media n	SD	Mean	Media n	SD	Mean	Media n	SD	Mean	Media n	SD
Muscat (Muscat)	34.17	28.47	25.89	36.11	31.25	31.39	26.11	13..33	29.11	20.14	2.78	30.27	28.54	21.67	26.98
Dhofar (Dhofar)	29.67	27.08	23.64	26.69	22.92	25.40	16.09	10.00	22.18	15.45	0.00	20.49	25.71	17.22	23.49
Musandam (Musandam)	36.51	36.11	23.39	30.52	20.83	27.10	20.97	13.33	22.96	22.35	5.56	28.62	29.24	27.78	21.67
Al-Buraymi	51.09	54.17	18.31	50.88	58.33	32.26	37.19	33.33	27.40	27.48	0.00	34.86	48.48	46.67	23.35
Adh-Dhahirah (Adh-Dhahirah)	37.01	35.42	24.64	35.42	25.00	33.32	23.14	20.00	24.42	31.05	16.67	34.90	34.08	27.78	26.26
	42.06	43.06	23.41	40.96	33.33	33.48	28.18	23.33	26.17	29.77	16.67	34.59	39.24	36.67	25.98
Ad-Dhakhliyah (Ad-Dhakhliyah)	20.71	16.67	21.55	21.95	16.67	22..72	12.19	6.67	14.95	19.61	2.78	24.48	25.47	20.00	20.72
Al-Batinah North (Al-Batinah)	41.69	38.89	24.76	52.22	54.17	34.16	37.01	26.67	33.19	40.49	33.33	36.84	47.82	45.56	27.58
Ash-Sharqiah North	29.38	31.94	17.62	15.53	4.17	22.48	17.84	20.00	15.66	30.88	33.33	28.55	23.32	20.00	17.11
Ash-Sharqiah South	32.36	36.11	26.06	30.86	16.67	31.00	24.23	10.00	28.66	21.47	16.67	26.68	27.29	22.22	23.49
(Ash-Sharqiah)	30.35	31.94	20.67	20.50	8.33	26.42	19.91	16.67	20.87	27.83	19.44	28.19	24.61	20.00	19.39
Total	30.73	29.17	23.81	28.79	20.83	28.73	20.06	13.33	23.44	23.45	13.89	28.73	29.14	25.56	23.47
F-statistic		15.39			17.89			1.75			4.07			6.24	
P-value		<0.01			<0.01			<0.01			<0.01			<0.01	
N		809			808			808			578			803	
Missing N (%)		11 (1.3)			12 (1.5)			12 (1.5)			242 (29.5)			17 (2.1)	

Table 23 Means, median and standard deviation for diabetes severity and quality of life scores in a sample of diabetic patients in Oman

Governorate	Cluster	Severity of Diabetes			Overall quality of life		
		Mean	Median	SD	Mean	Median	SD
Muscat	Muscat	2.78	2.00	1.80	4.33	5.00	2.08
Dhofar	Dhofar	3.02	4.00	1.43	4.58	5.00	1.34
Musandam	Musandam	3.06	3.00	1.24	4.59	5.00	1.58
	Adh-Dhahirah	3.38	4.00	1.43	4.42	5.00	1.59
Al-Buraymi		3.58	4.00	1.35	3.95	4.00	1.87
Adh-Dhahirah		3.26	4.00	1.48	4.68	5.00	1.36
Adh-Dhakhliyah	Ad-Dhakhliyah	2.95	3.00	1.20	5.14	5.00	1.34
Al-Batinah North	Al-Batinah	3.31	4.00	1.58	4.24	4.00	1.57
	Ash-Sharqiah)	3.38	4.00	1.33	5.04	5.00	1.35
Ash-Sharqiah North		3.59	4.00	1.16	5.17	5.00	0.96
Ash-Sharqiah South		2.92	3.00	1.53	4.78	5.00	1.92
Total		3.11	3.00	1.38	4.77	5.00	1.52
F-Statistic			2.21			6.14	
P-value			0.025			<0.01	
N			807			807	
Missing N (%)			13 (1.6)			13 (1.6)	

5.7.2. Multivariate analysis of quality of life and governorate

The aim of this section is to explore potential relationships between access to healthcare, quality of life and governorate with a view to finding out whether the relationship between access and quality of life is dependent on the governorate of residence. Here the hypothesis is that access is associated with quality of life, and therefore if we control for access, quality of life should not differ significantly in the various governorates. Later in this chapter, I shall examine the association between access, quality of life and glycated haemoglobin to understand how access determines health outcomes among diabetes patients,

but first I shall look at whether associations between governorate and HRQOL disappear when controlling for access.

Table 24 presents the results of a multivariate analysis of the relationship between Diabetes-39 domains and governorates, controlling for a different domain of Access-31 in each model. As we can see, there was no significant association here between governorate and the HRQOL domains of diabetes control, social burden, energy and mobility or severity of diabetes. This remained the case after controlling for geographical access, organisational access and affordability (Models A1, C1 and D1 in Table 23), and also after adjusting for age, sex, nationality, education, marital status and household size and income (Model A2, C2 and D2 in Table 24).

In linear regression analysis, geographical access, cultural acceptability and affordability were all significantly associated with the domains of diabetes control, anxiety and worry, social burden and energy and mobility (Appendix 12), and there were also significant differences between governorates (Section 5.5.1). One interpretation of this is that the variability in quality of life between governorates is explained by geographical access, access to information, cultural acceptability and affordability. As mentioned earlier in Section 5.3.1, 28.3% of respondents reported at least one problem related to geographical access, namely having to travel more than 30 minutes or cancelling an appointment because of a lack of transport or because they could not afford transport, and almost 36% reported no problems with cultural acceptability. On the other hand, only 4.9% reported at least one problem related to affordability.

Similarly, after controlling for access to information, social burden, energy and mobility and severity of diabetes were not found to be significantly associated with

governorate⁹. In one-way ANOVA, access to information was significantly associated with the three quality of life domains, and there were significant differences between governorates. Almost 83% of respondents had at least one problem related to access to information.

When controlling for the composite access score, it was found that social burden, energy and mobility and overall quality of life were not significantly associated with governorate, but energy and mobility and overall quality of life were, however, independently associated with the composite access score. It may therefore be deduced that access to healthcare explains much of the variability in quality of life among this population.

⁹ Severity of Diabetes was measured as a single question asking the participants to evaluate their severity of diabetes on a one to seven Likert scale.

Table 24 Multivariate analysis of relationship between Diabetes-39 HRQOL and governorate after controlling for Access-31 domains and composite score in a sample of diabetic patients in Oman

Dependent variable	Independent variable	Model 1: Adjustment only for access domain shown in models A-G						Model 2: Adjusted for access domains in models A-G and age, sex, education, nationality, marital status, HH size and HH income				
		N	Standardized Coefficient	t	95% CI		P-value	Standardized coefficients	t	95% CI		P-value
					Lower	Upper				Lower	Upper	
Models A: control variable ‘Geographical access’												
Diabetes control**	Governorate	809	-0.063	-1.79	-1.243	0.058	0.074	-0.46	-1.284	-1.109	0.232	0.200
Anxiety and worry**	Governorate	808	-0.081	-2.38	-1.681	-0.161	0.018*	-0.075	-2.141	-0.1623	-0.071	0.033*
Social burden*	Governorate	808	0.009	0.25	-0.552	0.714	0.803	0.020	0.565	3.824	8.879	0.572
Sexual function**	Governorate	578	0.139	3.35	0.629	2.417	0.001*	0.128	3.073	0.507	2.305	0.002*
Energy and mobility**	Governorate	803	0.010	0.28	-0.589	0.782	0.782	0.008	0.239	-0.593	0.757	0.811
Severity of diabetes**	Governorate	807	0.052	1.48	-0.009	0.066	0.140	.0540	1.500	-0.009	0.069	0.134
Overall QOL**	Governorate	807	0.063	1.79	-0.004	0.076	0.074	0.070	1.949	0.000	0.081	0.052
Models B: control variable ‘Access to information’												
Diabetes control**	Governorate	809	-0.097	-2.69	-1.595	-0.251	0.007*	-0.081	-2.209	-1.458	-0.086	0.027*
Anxiety and worry**	Governorate	808	-0.133	-3.69	-2.308	-0.705	<0.001*	-0.125	-3.448	-2.229	-0.612	0.001*
Social burden**	Governorate	808	-0.038	-1.05	-1.008	0.305	0.294	-0.027	-0.743	-0.921	0.415	0.458
Sexual function**	Governorate	578	0.095	2.27	0.140	1.946	0.024*	0.090	2.137	0.080	1.889	0.033*
Energy and mobility**	Governorate	803	-0.044	1.21	-1.150	0.273	0.227	-0.045	-1.269	-1.147	0.246	0.205

Dependent variable	Independent variable	Model 1: Adjustment only for access domain shown in models A-G							Model 2: Adjusted for access domains in models A-G and age, sex, education, nationality, marital status, HH size and HH income				
		N	Standardized Coefficient	t	95% CI		P-value		Standardized coefficients	t	95% CI		P-value
					Lower	Upper					Lower	Upper	
Severity of Diabetes	Governorate	807	0.022	0.62	-0.027	0.052	0.536		0.023	0.614	-0.028	0.053	0.539
Overall QOL***	Governorate	807	0.078	2.15	0.004	0.086	0.032*		0.085	2.312	0.007	0.091	0.021*
Models C: control variable 'Organisational access'													
Diabetes control**	Governorate	494	-0.141	-3.13	-2.086	-0.476	0.002*		-0.130	-2.762	-2.031	-0.342	0.006*
Anxiety and worry**	Governorate	493	-0.206	-4.61	-3.207	-1.290	<0.001*		-0.192	-4.136	-3.083	-1.097	<0.001*
Social burden	Governorate	493	-0.048	-1.04	-1.236	0.380	0.299		-0.041	-0.854	-1.210	0.477	0.394
Sexual function***	Governorate	327	0.113	2.04	0.045	2.397	0.042*		0.108	1.895	-0.044	2.370	0.059
Energy and mobility***	Governorate	491	-0.036	-0.78	-1.212	0.520	0.433		-0.049	-1.079	-1.322	0.385	0.281
Severity of diabetes**	Governorate	493	0.054	1.20	-0.018	0.075	0.232		0.065	1.378	-0.015	0.084	0.169
Overall QOL***	Governorate	493	0.054	1.19	-0.019	0.076	0.234		0.070	1.488	-0.012	0.086	0.137
Models D: control variable 'Affordability'													
Diabetes control**	Governorate	781	-0.052	-1.54	-1.149	0.171	0.147		-0.033	-0.904	-0.992	0.366	0.366
Anxiety and worry**	Governorate	780	-0.078	-2.26	-1.629	-0.115	0.024*		-0.070	-1.966	-1.543	-0.001	0.050
Social burden**	Governorate	780	0.029	0.83	-0.361	0.889	0.407		0.045	1.251	-0.233	1.050	0.211
Sexual function**	Governorate	560	0.151	3.60	0.747	2.541	<0.001*		0.138	0.288	0.592	2.414	0.001*
Energy and mobility**	Governorate	775	0.023	0.64	-0.470	0.928	0.521		0.025	0.714	-0.435	0.933	0.475

Dependent variable		Independent variable		Model 1: Adjustment only for access domain shown in models A-G					Model 2: Adjusted for access domains in models A-G and age, sex, education, nationality, marital status, HH size and HH income				
		N		Standardized Coefficient	t	95% CI		P-value	Standardized coefficients	t	95% CI		P-value
						Lower	Upper				Lower	Upper	
Severity of diabetes**	Governorate	779		0.063	1.79	-0.003	0.073	0.074	0.066	1.806	-0.003	0.076	0.071
Overall QOL**	Governorate	779		0.074	2.07	0.002	0.083	0.039*	0.079	2.176	0.004	0.087	0.030*
Models E: control variable ‘Cultural acceptability’													
Diabetes control**	Governorate	809		-0.075	-2.17	-1.364	-0.068	0.030*	-0.062	-1.730	-1.257	0.079	0.084
Anxiety and worry**	Governorate	808		-0.106	-3.12	-1.969	-0.450	0.002*	-0.101	-2.928	-1.925	-0.380	0.004*
Social burden**	Governorate	808		-0.011	-0.33	-0.726	0.517	0.741	-0.002	-0.068	-0.661	0.617	0.946
Sexual function**	Governorate	578		0.130	3.14	0.536	2.319	0.002*	0.114	2.709	0.343	2.152	0.007*
Energy and mobility**	Governorate	803		-0.009	-0.27	-0.780	0.593	0.789	-0.015	-0.447	-0.831	0.522	0.655
Severity of diabetes**	Governorate	807		0.039	1.10	-0.017	0.059	0.272	0.036	0.991	-0.020	0.059	0.327
Overall QOL**	Governorate	807		0.077	2.25	0.006	0.084	<0.001*	0.088	2.516	0.011	0.091	0.012*
Models F: control variable: ‘Availability of services and medicines’													
Diabetes control**	Governorate	613		-0.084	-2.10	-1.500	-0.049	0.036*	-0.069	-1.665	-1.399	0.115	0.097
Anxiety and worry**	Governorate	612		-0.113	-2.88	-2.104	-0.399	0.004*	-0.101	-2.516	-1.996	-0.246	0.012*
Social burden**	Governorate	612		0.024	0.61	-0.472	0.900	0.540	0.038	0.928	-0.377	1.053	0.354
Sexual function**	Governorate	430		0.138	2.88	0.479	2.532	0.004*	0.121	2.442	0.256	2.367	0.015*
Energy and mobility**	Governorate	610		0.011	0.27	-0.682	0.896	0.790	0.003	-0.074	-0.752	0.810	0.941

Dependent variable		Independent variable		Model 1: Adjustment only for access domain shown in models A-G					Model 2: Adjusted for access domains in models A-G and age, sex, education, nationality, marital status, HH size and HH income				
		N		Standardized Coefficient	t	95% CI		P-value	Standardized coefficients	t	95% CI		P-value
						Lower	Upper				Lower	Upper	
Severity of diabetes**	of	Governorate	612	0.089	2.27	0.006	0.092	0.024*	0.094	2.274	0.007	0.097	0.023*
Overall QOL**		Governorate	612	0.073	1.81	-0.003	0.084	0.002*	0.080	1.919	-0.001	0.089	0.055
Models G: control variable ‘Overall access’													
Diabetes control		Governorate	395	-0.145	-2.82	-2.090	-0.371	0.005*	-0.128	-2.338	-2.013	-0.174	0.020*
Anxiety and worry**	and	Governorate	394	-0.235	-4.69	-3.378	-1.382	<0.005*	-0.210	-3.962	-3.187	-1.073	<0.001*
Social burden		Governorate	394	-0.007	-0.14	-0.877	0.762	0.890	0.009	0.171	-0.799	0.951	0.865
Sexual function**		Governorate	255	0.140	2.24	0.176	2.708	0.026*	0.135	2.111	0.093	2.705	0.036*
Energy and mobility**	and	Governorate	394	-0.022	-0.42	-1.144	0.738	0.671	-0.022	-0.440	-1.143	0.725	0.660
Severity of diabetes**	of	Governorate	394	0.113	2.23	0.007	0.109	0.026*	0.136	2.513	0.015	0.125	0.012*
Overall QOL**		Governorate	394	0.051	0.99	-0.025	0.075	0.322	0.044	0.820	-0.031	0.074	0.413
● = P-value for variable governorate is significant ** = Both models are significant *** = Model 1 is significant													

5.8. Glycated haemoglobin

5.8.1. Glycated haemoglobin and governorate

In this section I shall answer the research question “Is glycaemic control different between governorates?” To do this I cross-tabulated HbA1c as a dichotomous variable against governorates. Controlled glycated haemoglobin as indicated by HbA1c <6.5% was significantly different between governorates, with an χ^2 for the difference of 30.79 and a p-value of <0.001. The highest rate of controlled glycated haemoglobin was observed in the capital, Muscat (44.4%), and the lowest in Dhofar (13.4%) and Ash-Sharqiah South (13.7%).

Table 25 Glycated haemoglobin by governorate in a sample of diabetic patients in Oman

Governorate	Cluster	HbA1c< 6.5	HbA1c >=6.5	Total	Missing (%)
		N (%)	N (%)		
Muscat	Muscat	24 (44.4)	30 (55.8)	54	1 (1.8)
Dhofar	Dhofar	11 (13.4)	71 (86.6)	82	1 (1.2)
Musandam	Musandam	53 (31.7)	114 (68.3)	167	1 (0.6)
	Adh-Dhahirah	21 (30.9)	47 (69.1)	68	0 (0)
Al-Buraymi		9 (33.3)	18 (66.7)	23	0 (0)
Adh-Dhahirah		12 (29.3)	30 (71.4)	42	0 (0)
Ad-Dhakhliyah	Ad-Dhakhliyah	65 (31.4)	142 (68.6)	207	3 (1.4)
Al-Batinah North	Al-Batinah	12 (21.8)	43 (78.2)	55	4 (6.8))
	Ash-Sharqiah	30 (17.0)	146 (83.0)	176	1 (0.6)
Ash-Sharqiah North		23 (18.4)	102 (81.6)	125	1 (0.8)
Ash-Sharqiah South		7 (13.7)	44 (86.3)	51	0 (0)
Total		216 (26.7)	593 (73.3)	809	11 (1.3)

5.8.2. Binary logistic analysis of glycated haemoglobin and governorate:

Logistic regression of glycated haemoglobin with governorate was carried out using HbA1c as a binary variable and controlling for Access-31 domains and composite access

score individually. Under the non-controlled model, participants from Dhofar and Ash-Sharqiah South showed a higher likelihood of uncontrolled diabetes ($HbA1c > 6.5$): for Dhofar the odds ratio was 5.67 (CI=1.196-26.84, P-value=0.029), and for Ash-Sharqiah South it was 6.11 (CI=1.12-33.43, P-value=0.37).

After controlling for both geographical access and access to information the same governorates showed a higher likelihood of uncontrolled diabetes. After controlling for geographical access and access to information, for Dhofar the ORs for $HbA1c > 6.5$ were 5.863 (CI=1.22-27.86, P-value=0.03) and 5.75 (CI=1.210-27.43, P-value=0.03) respectively, whereas for Ash-Sharqiah South, the ORs for $HbA1c > 6.5$ were 6.20 (CI=1.13-33.20, P-value=0.04) and 6.04 (CI=1.10-33.17, P-value=0.04).

Being a resident of Ash-Sharqiah North was statistically significant when cultural acceptability, availability of services and medicines or composite access score were the control variables. The ORs for these models were: 4.58 (CI= 1.06-19.71, P-value=0.041), 5.57 (CI=1.12-27.59, P-value=0.03) and 12.42 (CI=1.62-95.27, P-value=0.02) respectively.

In Dhofar governorate, on the other hand, the OR for $HbA1c > 6.5$ after controlling for cultural acceptability was 6.26 (CI=1.31-30.00, P-value=0.02), and in Ad-Dhakhliyah, after controlling for overall access, it was 6.68 (CI=1.02-43.64, P-value=0.047).

Under the models where organisational access and affordability were the control variables, residing in none of the governorates showed statistical significance. One interpretation of this is that the odds for uncontrolled diabetes might be conditioned by access, more specifically organisational access, and affordability.

The results for Musandam, Al-Buraymi, Adh-Dhahirah and Al-Batinah North were not statistically significant under any of the models presented, including the uncontrolled one. It is not therefore possible to deduce any correlations for these governorates on the basis of this analysis.

Table 26 Binary logistic regression of glycaemic control by governorate after controlling for each domain in Access-31 and composite score for a sample of diabetic patients in Oman

Control	Independent variable	N	Model 1: Unadjusted				Model 2: Adjusted for age, sex, education, nationality, marital status, HH size and HH income			
			β	OR	95% CI		β	OR	95% CI	
					Lower	Upper			Lower	Upper
None		809								
	Muscat (Ref)									
	Dhofar		-0.727	0.483	0.204	1.143	0.098	1.734	5.67	1.196 26.838 0.029*
	Musandam		0.948	2.582	1.026	6.496	0.044*	0.729	2.07	0.556 7.719 0.278
	Al-Buraymi		-0.150	0.860	0.409	1.812	0.692	0.626	1.87	0.289 12.104 0.511
	Adh-Dhahirah		0.899	2.457	0.867	6.967	0.091	1.155	3.18	0.526 19.163 0.208
	Ad-Dhakhliyah		-0.090	0.914	0.301	2.780	0.875	0.947	2.58	0.732 9.085 0.140
	Al-Batinah North		-0.128	0.880	0.424	1.828	0.732	1.128	3.09	0.640 14.918 0.160
	Ash-Sharqiah North		0.229	1.257	0.511	3.092	0.618	1.397	4.04	0.946 17.267 0.059
	Ash-Sharqiah South		0.583	1.791	0.799	4.018	0.157	1.811	6.11	1.118 33.430 0.037*
Geographical access		809								
	Muscat (Ref)									
	Dhofar		-0.731	0.482	0.203	1.145	0.098	1.763	5.83	1.221 27.855 0.027*
	Musandam		0.961	2.615	1.028	6.652	0.044*	0.682	1.98	0.524 7.465 0.314
	Al-Buraymi		-0.139	0.870	0.413	1.835	0.715	0.713	2.04	0.309 13.462 0.459
	Adh-Dhahirah		0.933	2.543	0.891	7.257	0.081	1.115	3.05	0.501 18.562 0.226
	Ad-Dhakhliyah		-0.210	0.810	0.257	2.551	0.719	0.931	2.54	0.713 9.026 0.150
	Al-Batinah North		-0.060	0.941	0.450	1.969	0.873	1.145	3.14	0.646 15.286 0.156
	Ash-Sharqiah North		0.236	1.266	0.508	3.156	0.613	1.342	3.83	0.883 16.591 0.073
	Ash-Sharqiah South		0.646	1.908	0.847	4.298	0.119	1.825	6.21	1.126 33.203 0.036*

Control	Independent variable	N	Model 1: Unadjusted					Model 2: Adjusted for age, sex, education, nationality, marital status, HH size and HH income				
			β	OR	95% CI		P-value	β	OR	95% CI		P-value
					Lower	Upper				Lower	Upper	
Access to information		809										
	Muscat (Ref)											
	Dhofar		-0.721	0.486	0.206	1.151	0.101	1.748	5.75	1.203	27.433	0.028*
	Musandam		0.916	2.498	0.981	6.364	0.055	0.739	2.09	0.559	7.831	0.273
	Al-Buraymi		-0.180	0.836	0.392	1.781	0.642	0.627	1.87	0.289	12.125	0.511
	Adh-Dhahirah		0.893	2.443	0.861	6.930	0.093	1.140	3.13	0.514	19.014	0.216
	Ad-Dhakhliyah		-0.094	0.910	0.299	2.770	0.869	0.941	2.56	0.726	9.041	0.143
	Al-Batinah North		-0.131	0.877	0.422	1.822	0.724	1.111	3.04	0.622	14.826	0.170
	Ash-Sharqiah North		0.239	1.270	0.516	3.182	0.603	1.384	3.99	0.927	17.170	0.063
Ash-Sharqiah South		0.587	1.799	0.802	4.037	0.154	1.799	6.04	1.102	33.166	0.038*	
Organisational access		491										
	Muscat (Ref)											
	Dhofar		-0.970	0.379	0.107	1.344	0.133	0.999	2.72	0.386	19.104	0.316
	Musandam		0.928	2.528	0.660	9.691	0.176	0.448	1.57	0.314	7.798	0.584
	Al-Buraymi		-0.049	0.952	0.314	2.888	0.931	0.824	2.28	0.260	19.973	0.457
	Adh-Dhahirah		0.509	1.664	0.326	8.493	0.540	0.789	2.20	0.254	19.052	0.474
	Ad-Dhakhliyah		-0.003	0.997	0.212	4.677	0.997	0.870	2.39	0.501	11.375	0.275
	Al-Batinah North		-0.033	0.968	0.291	3.215	0.957	0.863	2.37	0.328	17.114	0.392
	Ash-Sharqiah North		0.467	1.596	0.384	6.633	0.520	1.384	3.99	0.761	20.955	0.102
Ash-Sharqiah South		0.506	1.659	0.531	5.184	0.384	1.874	6.52	0.532	79.723	0.142	
Affordability		780										
	Muscat (Ref)											
	Dhofar		-0.911	0.402	0.164	0.988	0.047*	1.480	4.39	0.894	21.593	0.068
	Musandam		0.931	2.538	1.003	6.421	0.049*	0.426	1.53	0.390	6.013	0.541

Control	Independent variable	N	Model 1: Unadjusted				Model 2: Adjusted for age, sex, education, nationality, marital status, HH size and HH income					
			β	OR	95% CI		P-value	β	OR	95% CI		P-value
					Lower	Upper				Lower	Upper	
	Al-Buraymi		-0.154	0.857	0.405	1.816	0.688	0.005	1.01	0.133	7.604	0.997
	Adh-Dhahirah		0.989	2.689	0.901	8.028	0.076	1.041	2.83	0.456	17.562	0.264
	Ad-Dhakhliyah		-0.361	0.697	0.220	2.204	0.539	0.670	1.95	0.524	7.286	0.319
	Al-Batinah North		-0.110	0.896	0.429	1.873	0.770	0.845	2.33	0.458	11.836	0.309
	Ash-Sharqiah North		0.237	1.267	0.512	3.134	0.609	1.276	3.58	0.806	15.932	0.094
	Ash-Sharqiah South		0.645	1.905	0.846	4.293	0.120	1.807	6.09	0.895	41.562	0.065
Cultural acceptability		808										
	Muscat (Ref)											
	Dhofar		-0.810	0.445	0.187	1.059	0.067	1.834	6.26	1.305	30.004	0.022*
	Musandam		0.998	2.712	1.075	6.844	0.035*	0.826	2.28	0.607	8.597	0.222
	Al-Buraymi		-0.124	0.883	0.419	1.864	0.745	0.618	1.86	0.282	12.203	0.520
	Adh-Dhahirah		0.851	2.343	0.824	6.662	0.110	1.242	3.46	0.568	21.103	0.178
	Ad-Dhakhliyah		-0.091	0.913	0.299	2.785	0.873	1.019	2.77	0.784	9.782	0.114
	Al-Batinah North		-0.075	0.928	0.445	1.934	0.842	0.985	2.68	0.543	13.211	0.226
	Ash-Sharqiah North		0.142	1.152	0.465	2.853	0.759	1.521	4.58	1.063	19.711	0.041*
	Ash-Sharqiah South		0.640	1.896	0.842	4.268	0.122	1.674	5.36	0.969	29.355	0.054
Service and medicine availability		613										
	Muscat (Ref)											
	Dhofar		-1.051	0.349	0.126	0.970	0.044*	0.700	2.01	0.346	11.729	0.436
	Musandam		0.961	2.614	0.852	8.023	0.093	0.872	2.39	0.506	11.103	0.271
	Al-Buraymi		0.171	1.186	0.495	2.841	0.702	0.629	1.88	0.175	20.061	0.603
	Adh-Dhahirah		1.156	3.177	0.752	13.417	0.116	1.060	2.89	0.349	23.874	0.325
	Ad-Dhakhliyah		-0.228	0.796	0.206	3.078	0.741	1.062	2.89	0.735	11.366	0.129
	Al-Batinah North		0.073	1.076	0.455	2.543	0.868	0.419	1.52	0.219	10.558	0.672

Control	Independent variable	N	Model 1: Unadjusted					Model 2: Adjusted for age, sex, education, nationality, marital status, HH size and HH income				
			β	OR	95% CI		P-value	β	OR	95% CI		P-value
					Lower	Upper				Lower	Upper	
	Ash-Sharqiah North		0.739	2.084	0.644	6.807	0.219	1.717	5.57	1.124	27.594	0.035*
	Ash-Sharqiah South		0.718	2.049	0.824	5.096	0.123	1.189	3.28	0.415	25.965	0.260
Access (composite score)		392										
	Muscat (Ref)											
	Dhofar		-1.706	0.182	0.042	0.779	0.022*	1.693	5.44	0.581	50.866	0.138
	Musandam		0.908	2.479	0.522	11.765	0.253	1.877	6.53	0.772	55.271	0.085
	Al-Buraymi		0.052	1.053	0.304	3.650	0.935	1.418	4.13	0.178	95.693	0.376
	Adh-Dhahirah		1.186	3.274	0.309	34.707	0.325	0.666	1.95	0.181	20.949	0.583
	Ad-Dhakhliyah		-0.627	0.534	0.084	3.384	0.505	1.899	6.68	1.023	43.641	0.047*
	Al-Batinah North		0.354	1.424	0.362	5.600	0.612	0.881	2.41	0.210	27.743	0.480
	Ash-Sharqiah North		0.297	1.346	0.267	6.797	0.719	2.519	12.41	1.618	95.268	0.015*
	Ash-Sharqiah South		0.423	1.526	0.440	5.300	0.505	1.985	7.28	0.348	152.101	0.200
		(*) P-Value <0.05, the variable has a statistically significant association										

5.9. Access -31, quality of life and glycated haemoglobin

5.9.1. Access and quality of life

To measure variability in quality of life across Access-31 domains, I ran an ordinal logistic regression of patient-reported overall quality of life as a dependent variable, and Access-31 domains as independent binomial variables. The first model was without adjustment, while in the second model I adjusted for governorate of residence and in the third for socio-economic determinants, namely age, sex, education, nationality, marital status and household size and income. Average income per family for each governorate was also included as a measure of poverty, and this data was taken from the findings of the Household Income and Expenditure Survey 2012, with the number of physicians per 1,000 population for each *wilayat*¹⁰ taken from the MoH statistics data (NCSI, 2012; Department of health information and statistics, 2018).

Ordinal regression analysis was also used to assess the relationship between self-reported diabetes severity (single-item question) and individual Access-31 domains and Access-31 composite score, and the findings are presented below.

- **Geographical access**

Geographical access was significantly associated with quality of life and severity of diabetes. The P-value for this association was significant in models 1, 2 and 3 for both outcome variables. When adjusting for governorate, socio-economic variables and number of physicians per 1,000 population, the regression coefficients for overall quality of life

¹⁰ A *wilayat* is the smallest administrative unit. Each governorate is composed of 6-10 *wilayats*.

increased from -0.485 in the non-adjusted model to -0.506, and from 0.457 to 0.674 in diabetes severity (Table 26-28). Geographical access is coded as either 0 or 1, where 1 indicates at least one problem reported and 0 no reported problem, and quality of life is graded on a 7-point Likert scale of patient-reported overall quality of life. This means that participants who reported at least one problem in geographical access score had a lower quality of life score by almost 0.5, indicating that geographical access is strongly associated with quality of life and severity of diabetes.

- **Access to information**

There was no significant association between access to information and quality of life or severity of diabetes. This remained true after controlling for socio-economic variables, governorate, household income by governorate and ratio of physicians per 1,000 population in the *wilayat* (Tables 27-28).

- **Organisational access**

When the unadjusted model of organisational access was run against quality of life, the association was not statistically significant, but that changed when the adjusted models (P-value <0.05) were applied. The size of this effect was -0.550 when adjusting for governorate only, a figure which went down to -0.588 when adjustment for governorate, SES, average income per HH in the governorate, and ratio of physicians to 1,000 population in the *wilayat* was introduced into the model. This shows that the quality of life reported went down by 0.588 where there was a problem with organisational access.

Organisational access and severity of diabetes were significantly associated under both non-adjusted and adjusted models. The regression coefficient increased from 0.465 in model 1 to 0.725 in model 2 and 0.794 in model 3, indicating that survey participants who reported at least one problem in this domain had lower severity of diabetes by 0.79. This is

another important finding in terms of the association between organisational access and severity of diabetes.

-Affordability

There was no significant association between the model estimates for affordability and quality of life, though affordability did show a statistically significant association with severity of diabetes. The three model estimates for the severity of diabetes and affordability had a P-value of <0.05 , and the regression coefficient was more than 1.3 for the adjusted models. This shows that respondents with affordability problems also reported that their diabetes was on average more severe than the non-problem group, by 1.3.

- Cultural acceptability

Problems with cultural acceptability showed a significant association with quality of life, but not with severity of diabetes. In the non-adjusted model of quality of life as a respondent variable, the effect estimate was -0.618, which fell to -0.547 in model 2 and 0.526 in model 3.

- Availability of services and medicines

Respondents who reported problems with availability of services and medicines were more likely to report lower quality of life and greater severity of diabetes. The effect estimates for the quality of life models were -0.396, -0.463 and -0.425 for models 1, 2 and 3 respectively, and the p-values were <0.05 , while the effect estimates for the severity of diabetes models were 0.457, 0.779 and 0.564 for models 1, 2 and 3.

- Composite score for Access-31

As described above (Section 5.3.7), the composite access score was calculated by adding up the scores of the six Access-31 domains and then classifying them into groups as follows: 0 = no problem, 1 = 1-3 problems, 2 = 4-6 problems and 3 => 6 problems. Estimates of the ordinal regression analysis of this index against self-reported quality of life and severity

of diabetes were statistically significant for all models (Tables 27-28). As regards quality of life, the effect estimates were -0.214, -0.386 and -0.406 for models 1, 2 and 3 respectively, while for severity of diabetes they were 0.378, 0.623 and 0.618.

These findings show that for every score increment in the composite access score, there is a reduction of 0.406 in quality of life and an increase of 0.618 in severity of diabetes. Although some of the individual domains were not statistically significant, the composite score that included all domains showed a clear association between access and disease status as indicated by quality of life and diabetes severity.

Table 27 Adjusted and unadjusted ordinal logistic regression models for Access-31 domains against self-reported quality of life in a sample of diabetic patients in Oman

Model 1: Unadjusted						Model 2: Adjusted for governorate					Model 3: Adjusted for governorate, age, sex, education, nationality, marital status, HH size, HH income, the average income in the governorate and physicians per 1000 population in the wilayat				
	N	Estimate	95% CI		P-value	N	Estimate	95% CI		P-value	N	Estimate	95% CI		P-value
			Lower	Upper				Lower	Upper				Lower	Upper	
Geographical access	807	-0.486	-0.751	-0.22	<0.001*	807	-0.485	-0.760	-0.211	0.001*	807	-0.506	-0.788	-0.224	<0.001*
Access to information	807	0.311	-0.017	0.639	0.063	807	0.134	0.212	0.48	0.447	807	-0.143	-0.508	0.222	0.443
Organisational access	493	0.236	-0.561	0.089	0.154	493	-0.550	-0.946	-0.154	0.007*	493	-0.588	-1.052	-0.152	0.008*
Affordability	779	-0.567	1.141	0.007	0.053	779	-0.404	-1.132	0.325	0.278	779	-0.434	-1.171	0.303	0.249
Cultural acceptability	807	-0.618	-0.877	-0.359	<0.001*	807	-0.547	-0.884	-0.263	<0.001*	807	-0.526	-0.857	-0.195	0.002*
Availability of services and medicines	612	-0.396	-0.68	-0.111	0.006*	612	-0.463	-0.801	-0.125	0.007*	612	-0.425	-0.822	-0.028	0.036*
Access	394	-0.215	-0.439	0.008	0.059	394	-0.386	-0.666	-0.106	0.007*	394	-0.406	-0.721	-0.091	0.012*
*Significant association															

Table 28 Ordinal logistic regression analysis of Access-31 domains against severity of diabetes in adjusted and non-adjusted models of diabetic patients in Oman

Model 1: Unadjusted						Model 2: Adjusted for governorate					Model 3: Adjusted for governorate, age, sex, education, nationality, marital status, HH size, HH income, average income in governorate and physicians per 1,000 population in wilayat				
Independent variable	N	Estimate	95% CI		P-value	N	Estimate	95% CI		P-value	N	Estimate	95% CI		P-value
			Lower	Upper				Lower	Upper				Lower	Upper	
Geographical access	807	0.457	0.181	0.734	0.001*	807	0.558	0.215	0.901	0.001*	807	0.674	0.319	1.029	<0.001*
Access to information	807	0.101	-0.227	0.429	0.546	807	0.162	-0.18	0.503	0.354	807	0.417	0.052	0.783	0.052
Organisational access	493	0.465	-0.137	0.793	0.005*	493	0.725	0.291	1.16	0.001*	493	0.794	0.34	1.248	0.001*
Affordability	779	1.276	0.682	1.871	<0.001*	779	1.334	0.636	2.032	<0.001*	779	1.354	0.656	2.053	<0.001*
Cultural acceptability	807	0.162	-0.095	0.42	0.217	807	0.192	-0.125	0.51	0.235	807	0.006	-0.324	0.337	0.971
Availability of services and medicines	612	0.457	0.171	0.743	0.002*	612	0.779	0.407	1.151	<0.001*	612	0.564	0.157	0.971	0.007*
Access	394	0.378	0.151	0.605	0.001*	394	0.623	0.337	0.91	<0.001*	394	0.618	0.315	0.92	<0.001*
*Significant association															

5.9.2. Access and glycated haemoglobin:

Glycated haemoglobin (HbA1c) values were obtained from the medical records of participants and used as an indicator for diabetes control. The collinearity assumption was assessed before binary logistic regression was conducted by running the correlation matrix of the predictor variables. After this, binomial regression analysis was carried out using HbA1c as the dependent variable, and individual Access-31 domains and the composite index as independent variables.

All the models were significant, as the P-values for the F-statistics were <0.05 . After adjusting for governorate, age, sex, education, nationality, marital status, HH size and income, and time since last HbA1c, the odds ratio for the availability of services and medicines was found to be 3.02 (p-value <0.01). This indicates that among the group that experienced problems with availability of services and medicines, the odds of non-controlled glycated haemoglobin was three times higher than among the group that reported no problems in that domain. Similarly, the adjusted access composite score showed an OR of 2.6 for each additional increment in levels of problems with access, as compared to a baseline of no problems with access (P-value=0.012) (Table 29).

Table 29 Binary logistic regression of glycated haemoglobin and Access-31 domains in a sample of type-2 diabeics patients in Oman

Independent variable	Model 1: Unadjusted						Model 2: Adjusted for governorate						Model 3: Adjusted for governorate, age, sex, education, nationality, marital status, HH size and HH income					
	N	β	OR	95% CI		P-value	N	β	OR	95% CI		P-value	N	β	OR	95% CI		P-value
				Lower	Upper					Lower	Upper					Lower	Upper	
Geographical access	809	0.113	1.12	0.872	1.437	0.375	809	0.065	1.07	0.818	1.392	0.630	809	-0.143	0.87	0.564	1.332	0.514
Access to information	809	-0.049	0.95	0.817	1.109	0.528	809	-0.044	0.96	0.806	1.136	0.613	809	0.027	1.03	0.748	1.413	0.866
Organisational access	491	0.147	1.16	0.940	1.427	0.168	491	0.179	1.20	0.907	1.577	0.204	491	0.157	1.17	0.754	1.815	0.484
Affordability	780	0.760	2.14	0.980	4.667	0.056	780	0.906	2.47	1.085	5.643	0.031*	780	1.763	5.83	0.737	46.125	0.095
Cultural acceptability	808	0.151	1.16	0.945	1.430	0.153	808	0.184	1.20	0.963	1.499	0.104	808	0.401	1.49	0.996	2.241	0.053
Availability of services and medicines	613	0.273	1.31	1.035	1.667	0.025*	613	0.291	1.34	1.037	1.727	0.025*	613	1.107	3.02	1.649	5.547	<0.01*
Access*	392	0.301	1.35	1.001	1.823	0.049*	392	0.332	1.39	0.949	2.046	0.091	392	0.940	2.56	1.235	5.307	0.012*

5.9.3. Glycated haemoglobin and quality of life

I ran a binomial logistic regression of glycated haemoglobin as a dependent variable and individual Diabetes-39 domains as independent variables. Only severity of diabetes proved to be associated with glycated haemoglobin (HbA1c), and the OR observed was 1.51 (CI=1.22-1.88, P-value <0.01) (Table 30).

In a survey of hospitalised type-2 diabetes patients in South Africa, Daya *et al.* (2016) found that levels of glycated haemoglobin showed a significant association with diabetes control, social burden and sexual function. The correlation coefficients were, however, low (<0.3) for all three variables, and the authors did not report whether they controlled for socio-economic or other variables (Tonetto *et al.*, 2019), but on the other hand a correlation coefficient of 0.49 and 0.38 was reported for glycated haemoglobin against diabetes control and severity of diabetes respectively. Al Hayek *et al.* (2014), meanwhile, found that gender, age, duration of diabetes mellitus and presence of complications were all associated with glycated haemoglobin in a sample of Saudi type-2 diabetes patients.

The association between glycated haemoglobin and quality of life remains unclear, though, and this could be complicated by the presence of secondary illnesses such as hypertension (Dogan *et al.*, 2016). In this study I did not control for medical complications or duration of diabetes, and this may explain the lack of association observed in Table 30.

Table 30 Binary logistic regression of glycated haemoglobin against Diabetes-39 domains in a random sample of diabetic patients in Oman

Independent variable	Model 1: Unadjusted						Model 2: Adjusted for governorate						Model 3: Adjusted for governorate, age, sex, education, nationality, marital status, HH size, HH income and time since HbA1c test					
	N	β	OR	95% CI		P-value	N	β	OR	95% CI		P-value	N	β	OR	95% CI		P-value
				Lower	Upper					Lower	Upper					Lower	Upper	
Diabetes control	798	0.13	1.01	1.008	1.017	<0.001*	798	0.013	1.01	1.009	1.017	<0.001*	315	0.008	1.01	0.99	1.02	0.18
Anxiety and worry	797	0.009	1.01	1.006	1.013	<0.001*	797	0.010	1.01	1.006	1.013	<0.001*	315	-0.001	0.99	0.99	1.01	0.80
Social burden	797	0.007	1.01	1.003	1.011	0.001*	797	0.007	1.01	1.003	1.011	0.001*	315	0.001	1.00	0.99	1.01	0.95
Sexual function	569	0.007	1.01	1.003	1.012	<0.001*	569	0.006	1.00	1.002	1.011	0.005*	225	0.002	1.00	0.99	1.01	0.76
Energy and mobility	792	0.001	1.00	0.997	1.005	0.708	792	0.000	1.00	0.997	1.004	0.821	314	-0.004	0.99	0.99	1.01	0.47
Severity of diabetes	796	0.421	1.52	1.409	1.647	<0.001*	796	0.415	1.51	1.401	1.638	0.001*	315	0.414	1.51	1.22	1.88	<0.01*
Overall QOL	796	0.141	1.15	1.078	1.230	<0.001*	796	0.042	1.14	1.071	1.222	<0.001*	315	0.148	1.16	0.94	1.43	0.17

5.10. Summary

In this chapter I have discussed some aspects related to the validity and findings of a patient questionnaire measuring access to primary healthcare (Access-31). This tool consists of multiple domains, and I argue that each of these domains is essential to the overall index. To develop this questionnaire, I initiated the scientific enquiry through a literature review, and confirmed findings through patient focus groups and individual interviews, which was then followed by statistical validation to support my thesis.

The Access-31 composite index was associated with all outcome variables. Inter-item correlations between the domains had low coefficients, indicating that individual domains are poorly correlated, whereas total item correlations showed high values, suggesting that each domain shows a high degree of correlation with the composite access score. This supports the validity of the Access-31 questionnaire as a tool for the measurement of primary healthcare access from a patient perspective.

It may be observed that access to healthcare varied between the governorates in Oman, but that the differences were not consistent across domains. Al-Batinah North, for example, had the highest percentage of patients reporting problems with geographical access and cultural acceptability, while Ad-Dhakhliyah had the highest percentage reporting issues with access to information and organisational access, Al-Buraymi with problems of affordability, and Dhofar with the availability of services and medicines.

Overall, regression analysis showed that geographical access, organisational access, cultural acceptability and availability of services and medicines, as well as the access composite access index, all had significant associations with self-reported quality of life, and that this remained the case after controlling for governorate, age, sex, education, nationality, marital status and household income and size.

Only severity of diabetes, though, maintained an association with glycated hemoglobin in the model which included controls for age, sex and other confounders. It is noteworthy that among the Access-31 domains only availability of services and medicines was significantly associated with glycated haemoglobin, but each level of problems in the composite access score was associated with an increase of 2.6 in the likelihood of uncontrolled diabetes (as indicated by glycated haemoglobin). One approach for validating a formative index is external validity, and the association of Access-31 with quality of life and glycated haemoglobin could be interpreted as an indication of its validity (Diamantopoulos and Winklhofer, 2001).

Chapter 6. Discussion and Conclusion

Diabetes is a leading cause of morbidity and mortality both in Oman and globally, and rates have been continually rising since the 1970s (Institute of Health Metrics and Evaluation). Failure to control glucose levels among diabetic patients may compromise their quality of life and cause comorbidities and life-threatening complications (Kautzky-Willer *et al.*, 2016), and complications related to uncontrolled diabetes create a burden on health systems in most countries in the world.

To manage diabetes at a population level, the chronic care model stipulates that the organisation of the health system is of paramount importance (Glasgow *et al.*, 2001), and it also suggests that patient empowerment is of equal importance to health service provision (Barr *et al.*, 2003). This research proposes that access to care is a determinant for the functional and clinical outcome of diabetes. To test this hypothesis, a patient-centred approach was adopted to evaluate access to healthcare among type-2 diabetes patients in Oman, and statistical methods were used to measure the association between access, HbA1c and quality of life.

This is a study of access to primary healthcare. Initially, it begins by analysing the concept of access to care using Rodgers' evolutionary method, screening the literature to identify tools that measure access to primary healthcare. In the qualitative study, patient definitions of access were explored with a view to confirming the findings of the concept analysis, and a tool that was developed to measure access to primary healthcare.

The questionnaire was used in a cross-sectional study on type-2 diabetes patients attending primary healthcare facilities in Oman. At this stage, this tool was named Access-31, and a coding scheme was generated for access and its various domains. Access-31 questions, domains and composite score were described, and then the domains and

composite score were analysed by governorate. Finally, quality of life and glycated haemoglobin were also examined by governorate, and the relationships between access, quality of life and glycated haemoglobin assessed.

6.1. Summary of findings

6.1.1. Development of Access-31

Access to primary healthcare is perceived in two ways, namely having access (realised access) and the opportunity to gain access (potential access) (Andersen, 1995). In this study the focus was on how easy it is to obtain the healthcare otherwise named “accessibility.”

Since the 1970s the concept of access has evolved through the thousands of manuscripts published on the topic. Earlier concept analyses viewed access as a political construct, but by the turn of the 21st century a more patient-centred approach became common. One example of this transition is how “affordability” has emerged as a component of accessibility. The expression of financial capacity in terms of “cost” (Aday and Andersen, 1974) has evolved towards the use of the term “affordability”, in my view more patient-centred, in more recent publications (Levesque *et al.*, 2013; Campbell and Salisbury, 2015).

The accessibility of healthcare is a complex and multidimensional concept (Rutherford *et al.*, 2010; Cabieses and Bird, 2014; Khanassov *et al.*, 2016), and the dimensions that make up the concept are themselves debatable (Ricketts and Goldsmith, 2005). Based on concept analysis and the qualitative study, I offer six domains of accessibility, namely geographical access, access to information, organisational access, affordability, cultural acceptability and availability of services and medicines. This list is comparable with earlier frameworks, such as that of Levesque *et al.* (2013) (Figure 4).

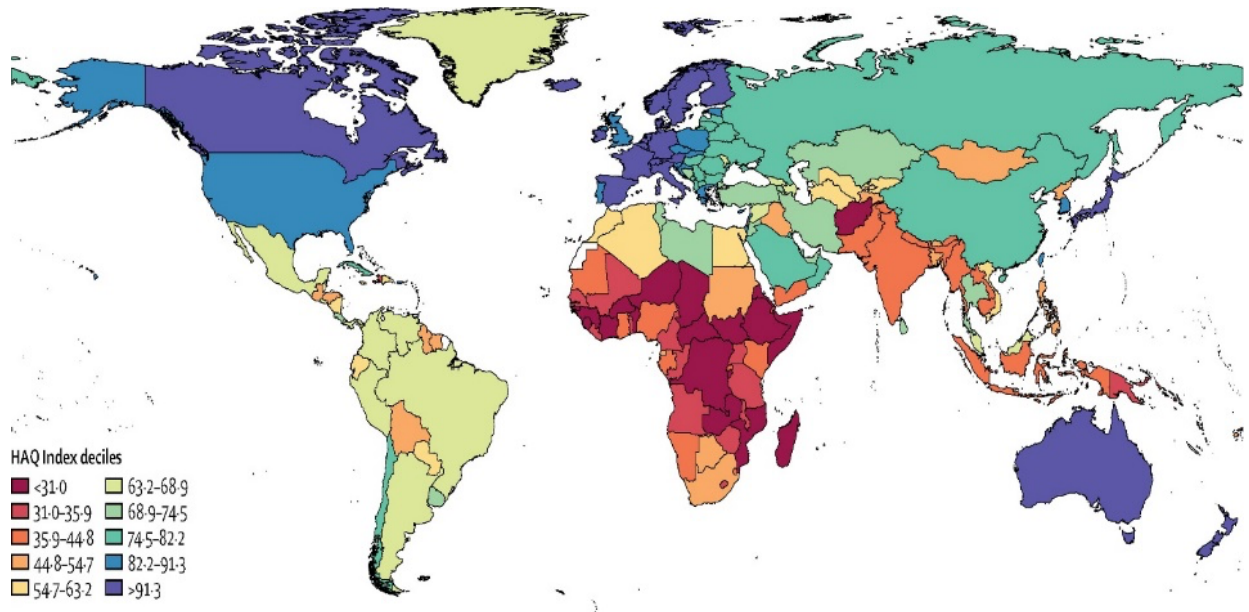
Beyond this, the research was extended to generate and to some extent validate a tool for measuring accessibility, and this tool was used in a cross-sectional survey among type-2 diabetic patients receiving primary healthcare in Oman.

6.1.2. A global perspective on access to primary healthcare

In many parts of the world, more and better healthcare is available to the wealthy and to those who live in larger cities, while low and middle-income countries face challenges related to the accessibility and continuity of primary healthcare (Bitton *et al.*, 2017). Lack of healthcare access has been reported as a problem in China, India, Pakistan and Brazil, for example (Wang *et al.*, 2018; Younger, 2016; Kurji *et al.*, 2016; Oliveira *et al.*, 2017), and the problem persists even in high-income countries such as Switzerland. Reports of a high level of cost-sharing of almost 26%, a figure that is even higher in low-income families, represent a barrier to healthcare for everyone in that country (De Pietro *et al.*, 2015). In the USA, the disadvantaged and those who live in rural areas receive less and poorer-quality care (Dickman *et al.*, 2017).

The Global Burden of Diseases study group has developed an index of access and quality of healthcare based on risk-standardised death rates. The group found high variability both between and within countries. Many countries from Sub-Saharan Africa had the worst accessibility scores, whereas European countries recorded the highest scores. Oman and most Middle Eastern countries were in the middle group, with the exception of Yemen and Iraq, for which the data shows very low access (Figure 9) (GBD 2016 healthcare access and quality collaborators, 2018).

Figure 8 Map of healthcare access and quality index values by deciles (GBD 2016)



6.1.3. Access to primary healthcare in Oman

Study participants did not in general report affordability problems, given that health services in Oman are provided almost free of charge for all Omanis. The minimal annual charge of 1OR (£1.97) is within the purchasing power of most citizens, given that, according to this survey, the monthly income of more than 60% of households was higher than 500OR. These findings cannot, however, be generalised, as only 5% of respondents were non-Omanis, compared to over 40% in the population as a whole (National Center of Statistics and Information, 2018). Non-Omanis do not enjoy free healthcare, and therefore the financial burden of healthcare for them remains unknown.

Geographical access was also only a minor problem for survey respondents, which could be due to the widespread network of primary healthcare facilities in all of Oman's governorates. In 2018, 207 primary healthcare facilities served 4.6 million residents in all corners of Oman (Department of Health Information and Statistics, 2019). Another area reported as non-problematic by most respondents was cultural acceptability, which

confirms the qualitative component of my research, in which most respondents recognised and appreciated the courtesy and rapport shown by Omani staff members.

In 2004, only 22.4% of the physicians at Ministry of Health institutions were Omanis. Since then, the Omani government has adopted a policy of Omanisation, with the aim of training thousands of Omanis and posting them to a variety of sectors. This has led to a gradual increase in the percentage of nationals in the healthcare sector over the last two decades (Alshishtawy, 2009). This transition from receiving healthcare from non-Arabic speaking non-Omanis to health centres that are run by nationals could explain why participants in the qualitative study appreciated the manner and behaviour of medical staff of a culture more familiar to them.

Half of the survey respondents reported problems with the availability of services and medicines, and 60% had problems with organisational access. The most problematic area was access to information, which is confirmed by a study by Al-Alawi *et al.* (2019) on primary care of diabetes patients attending primary healthcare centres in Muscat. In the latter study, infrastructure challenges were identified, including shared rooms, insufficient computers, inadequate IT support systems and a shortage of service providers. Al Alawi *et al.* also found that shortages of drugs were an important obstacle to quality primary care for diabetes in Oman. In another sample of patients attending primary healthcare in Muscat, Albalushi *et al.* (2012) reported high rates of satisfaction with access to services, but not with continuity of care.

6.1.4. Access-31 and geographical disparity

I found significant variations in the accessibility of healthcare between governorates. Respondents from Musandam had the best access to healthcare across all domains, while the worst experience of access to healthcare was reported in Al Batinah North, followed by Ad-Dhakhliyah. The latter two governorates scored poorly in all

domains. Respondents from Muscat, Al-Buraymi and Ash-Sharqiah South also reported inadequate access to healthcare.

I was not able to identify national studies on access to healthcare, but available surveys did show comparable results on specific questions. For example, Al-Kindi *et al.* (2019) reported that more than 90% of patients attending primary healthcare facilities in Muscat agreed that they were treated with respect, and in my survey, 90.7% reported no problems in answer to the same question. A study in Al Batinah-North found that 81.6 % of the respondents were satisfied with the language of communication used by primary care doctors (Al-Mandhary *et al.*, 2007), while the percentage in this study who reported not having any communication problems with physicians was 83.1% .

The differences recorded between governorates are consistent with the Ministry of Health's Annual Health Report. According to that report, the population served per hospital bed ranged between 626 and 1,650, and the population served by each primary healthcare centre ranged between 3,400 in Wusta and more than 25,000 in Al-Batinah North. Moreover, the same report shows that Musandam had the lowest population/bed ration (284 per bed), and the highest physician/population ratio (34.1 per 10,000) among all governorates in Oman. This confirms that the availability of primary healthcare services in Musandam is higher than in other governorates in Oman (Department of Health Information and Statistics, 2019). Musandam also reported the highest overall percentage of respondents reporting no problems regarding accessibility.

In Al-Batinah North, on the other hand, the total population served by all health centre in 2018 was 25,685, with an average of 1,650 per bed. These are the highest figures of all governorates in that year, and this confirms that there is some strain on staff and services in this governorate.

6.1.5. Access-31 and quality of life

One important finding in this study is that accessibility of healthcare is associated with quality of life. Logistic regression analysis shows us that the overall composite access score as well as geographical access, organisational access, cultural acceptability and the availability of services and medicines are all associated with self-reported quality of life. The negative regression estimates in the models indicate that poor access is associated with a lower quality of life.

The available literature supports those findings. In Oman, it has been reported that the perceived health status of patients attending primary healthcare facilities in Adh-Dhahirah governorate was associated with satisfaction with the structure of healthcare and the services provided (Al-Mandhari *et al.*, 2004). A survey of type-2 diabetes patients from six European countries also found that travel distance, travel time and waiting time in relation to health services were associated with improved health-related quality of life (Konerding *et al.*, 2017), and after community health workers delivered education and managed care services at five clinics in the United States, a cohort of patients showed improvements in glycated haemoglobin and quality of life (Kane *et al.*, 2016). Lontchi-Yimagou *et al.* (2017) on the other hand, observed conflicting results, with health-related quality of life before and after one year of free diabetes care for children and adolescents in Cameroon not showing any significant differences.

My findings suggest that HRQOL is associated with access to healthcare, but it is not possible to establish causality on the basis of this research, as there are several confounding factors for this relationship. Environment, gender, socio-economic status, culture, profession and lifestyle, for example, are all associated with HRQOL (Trikkalinou *et al.*, 2017). Besides, a systematic review carried out by Jing *et al.* (2018) showed that frequent glucose monitoring was associated with improved HRQOL, whereas the presence

of complications, depression, duration of diabetes and red meat consumption were all linked to worsened HRQOL. The accessibility of healthcare is also influenced by a multitude of factors that on one hand drive health-seeking behaviour, and on the other affect the accessibility of services. If the patient is illiterate and lacks health knowledge, it is possible that they may not understand the risks of diabetes and its complications, and consequently forego vital health visits, which may in turn influence their quality of life (Lazar and Davenport, 2018). Personal trust in healthcare providers may also limit interaction with health services and thus impact the patient's quality of life.

An association between access and self-reported quality of life is present, but several conditions must be satisfied to demonstrate causality. For example, temporal relationships between cause and effect, dose response and biological gradients are absent in any cross-sectional design, and reciprocal causality could be an alternative hypothesis. Reciprocal causality might occur when individuals with a lower quality of life have less access to healthcare as a result of their limited capacity to seek this healthcare. Because of these limitations causality cannot be inferred, but as there is a positive association between access and quality of life, so there is a theoretical basis for this relationship, and this provides a foundation to explore this relationship in other contexts and with different population groups (Kelsey, 1996; Hill, 1965).

6.1.6. Glycated haemoglobin, access to healthcare and quality of life

An important finding of this study is the association between access and glycated haemoglobin. The composite score shows such an association, but of the individual domains only availability of services and medicines is associated with HbA1c. One interpretation for this could be that collectively the individual domains are associated with disease outcome. An observational study among African Americans showed that trouble accessing medical care was associated with a 57% increase in HbA1c (Rhee *et al.*, 2005),

and, in a cohort of American adults, uninsured diabetic patients were 2.5 times more likely to have HbA1c > 9 (Zhang *et al.*, 2012).

The association between glycated haemoglobin and socio-economic status is well documented (Bijlsma-Rutte *et al.*, 2018), but literature on the effect of lack of geographical access, access to information, organisational access, affordability and problems with cultural acceptability remains scarce.

6.2. Strengths of the study

6.2.1. Methodology

The Access-31 tool used in this study was constructed from a combination of methods including literature review, patient focus groups and interviews, followed by quantitative analysis and some exploration of the validity of the questionnaire. In the concept analysis, an attempt was made to encompass various viewpoints and frameworks on access to healthcare, and indeed the amalgamation of knowledge from multiple tools and methods to inform Access-31 domains and items is one of the strengths of this study. There was no attempt to validate Access-31 using all possible analytical tools, but the variety of methods used to feed into the confirmation of the appropriacy of the questionnaire adds to these strengths. While it is impossible to include all relevant items, this tool is to the best of my knowledge more comprehensive than any other unidimensional measure of access available in the literature, and more specific than other relevant primary healthcare evaluation tools (Gilgun, 2004).

6.2.2. Cultural adaptation of Diabetes-39

At the outset, the questionnaires (Access-29) and (Diabetes-39) were translated and culturally adapted in accordance with recommended guidance (Guillemin *et al.*, 1993).

Khader *et al.* (2008) validated Diabetes-39 HRQOL tool for use in Jordan, but the Arabic dialect spoken in Oman is different from that of Jordan, so I adapted the questionnaire for the Omani context.

Arabic is used by more than 330 million people in the world, in the forms Classical Arabic, Modern-Standard Arabic (MSA) and colloquial Arabic. The Qur'an and classical literature are written in Classical Arabic, which has remained unchanged and is uniform across the Arab world. MSA (also known as *fus-ha*) is a dynamic form of classical Arabic that is used in modern writing, and this has evolved and adapted to the needs of society. Colloquial Arabic dialects, or *al-'Ammiyya*, are used in daily conversation and informal communications. The dialect used in the Arabian Peninsula (Saudi Arabia, Kuwait, United Arab Emirates, Bahrain, Oman and Yemen) is different from the Egyptian Arabic that is spoken in Egypt and Sudan, and from North African Arabic and the Levantine dialect which is spoken in Syria, Lebanon, Palestine and Jordan. Moreover, multiple sub-dialects are also used by Bedouins, urban dwellers, etc. (Al-Amer *et al.*, 2016; Diab and Habash, 2007).

I attempted to translate the Diabetes-39 and Access-31 questionnaires into MSA. When comparing Khader's and my own translation, five of the questionnaire items were different. For example, "Getting your diabetes under control" was translated by Khader *et al.* as "Seeking to keep diabetes under control", and in my questionnaire as "The necessity of keeping diabetes under control". "Concerns about your future" was translated by Khader *et al.* as "Fear about your future life" and by me as "Worries about your future". For the purposes of this research, it was believed that "fear" is too strong a term for expressing concern in the context of Omani culture, and therefore "worry" was used instead.

In general terms, however, the Arabic translation of Khader *et al.* and the one produced for this study are similar enough to be used interchangeably. There are minor differences, but it is not clear if these differences affect the validity, or to what extent. It

should, though, be noted that each version is comparable in terms of reliability, and that in both versions the questions maintain idiomatic and conceptual equivalence with the original tool.

6.2.3. Cross-sectional survey

- **Online survey**

Cross-sectional data was collected via an online survey. This has several advantages, including reducing the time, cost and effort required for data collection (Granello and Wheaton, 2004). The study questionnaire, developed on smartsurvey.co.uk (SmartSurvey, 2018), was designed to conform to ethical research standards. The first page included a patient information sheet, and patients were allowed to ask questions before proceeding to answer the questionnaire.

The other key advantages of online data collection are ease of data entry and control over the format, as well as elimination of data entry errors. I used multiple-choice options, jump questions and drop-down menus to ensure a user-friendly experience.

A text message with an individualised link was sent to each participant to ensure that only eligible participants responded to the questionnaire, and this was followed by multiple reminders by text messages and phone calls. Weekly monitoring of the accuracy of the sample was carried out in order to ensure that only identified individuals had responded to the survey.

Contact details for all individuals at health centres in Oman include a phone number for each patient or a relative. Some individuals in the sample did not own a smartphone or could not access the internet via their mobile, and in such cases a relative was contacted. The contact person at the health centre obtained consent from the participant and their relative to help to fill in the survey, and so the probability of non-response due to lack of access to a mobile phone was low. A national survey in 2013 on access to and use of

information and communication technology by households and individuals in Oman showed that more than 90% of households in Oman own at least one mobile or smartphone, and in this survey all individuals involved had a mobile phone number in their medical records (Ministry of Transport Communication and Information Technology, 2014). Universal availability of internet and mobile phones among the random sample of participants is one of the strengths of this study.

6.3. Limitations of the study

6.3.1. Limitations of concept analysis

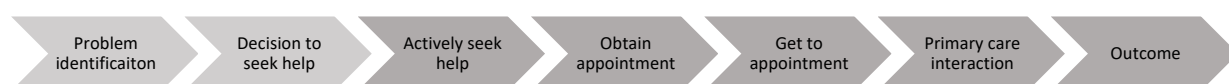
When collecting data for the concept analysis, I faced three obstacles that might have compromised the sensitivity and specificity of the review. Firstly, access to primary healthcare was not available as a MeSH term, and PubMed replaced this with alternative terms like “accessibility”, etc. The database therefore included terms that may or may not have been relevant to the search. Secondly, there was no clear distinction in the literature between primary healthcare, secondary healthcare and healthcare in general, and for that reason the database manuscripts pertained to all three categories of care. Thirdly, it was impossible to include all of the large number of articles retrieved, and therefore a sample was selected in accordance with recommended procedures (Section 2.1.4).

It is likely that the review missed relevant manuscripts because of these limitations. Indeed, it has been postulated that it is impossible for a complete concept definition or a questionnaire which includes all relevant items (Gilgun, 2004), and as such the concept analysis and tool used here merely represent a step towards understanding access to primary healthcare.

6.3.2. Context and accessibility

Ford *et al.* (2016) outlined several steps in the patient pathway to primary healthcare and for each of these explained context, mechanism and outcome (Figure 10). Of particular interest here are the contextual factors relating to accessibility of primary healthcare, and in this study my investigation into accessibility covers the steps from actively seeking help up to the primary care interaction shown in Figure 10.

Figure 9 Patient pathway to primary healthcare (Ford et al. 2016)



According to Ford *et al.* (2016), the contextual factors relating to actively seeking help are choice, clear information, educational status, experience of healthcare, extent to which practice is welcoming, relationship with the GP, self-efficacy and transport. As regards obtaining appointments, the factors are available appointments, capacity within the practice, clear information, ease of booking appointment, educational status, experience of healthcare, lifelong poverty, self-esteem, transport, understanding the practice's systems, and use of technology. The context of obtaining an appointment, meanwhile depends on community support, geographical isolation, social networks and transport. Finally, the context factors for primary care interaction are capacity within the practice, clinical empathy, continuity of care, educational status, emotional distress, experience of healthcare, financial resources, perceived ability to benefit, perceived discrimination, self-esteem, social distance and trust in healthcare.

Several of the contextual factors mentioned above formed part of the Access-31 questionnaire, such as geographical isolation, transport and clear information. Educational status was investigated in the statistical analysis, but I did not investigate social networks, emotional distress or the perceived ability to benefit, among others. These factors may therefore also be underlying causes for the variability observed between governorates.

In the construction of a questionnaire, patient experience of healthcare is measured through reporting and evaluation, but the patient report questionnaire may also include an evaluative component (Ahmed *et al.*, 2014). In this study, the questions on cultural acceptability, such as “In the past 12 months, have you ever been treated with disrespect during your visit to the health centre?”, provide an example of this. It is my view that respect is a concept that is highly dependent on context and is influenced by the respondent’s values and culture.

6.3.3. Development and face validity of Access-31

Following the qualitative research, I added two questions, of which one was:

“When you talk to your GP, does he explain your illness and respond to your questions in a manner that you are satisfied with?”

This question incorporates two constructs: explaining illness, which is of relevance to access to information, and responding to questions in a manner that you are satisfied with, which is relevant to cultural acceptability. Double-barrelled questions may be difficult to understand, interpret and respond to from the participant’s point of view, and they also make it harder for the researcher to interpret results. For these reasons, in future research this question should be broken down into two items (Lavrakas, 2008).

A patient instrument for use in health research should be valid, reliable and responsive to change (Mokkink *et al.*, 2010). Validity is made up of face validity, content validity, construct validity and criterion validity, while reliability covers internal

consistency and measurement error. Face and content validity were assessed via qualitative methods, and inter-item and total item analyses were used to assess construct validity (Sections 4.4, 4.5, 5.3.8).

I modified the questions with the aim of making them context-specific for soliciting patient experience of access. The design of the questions could be further improved, though. For example, in some questions I ask participants to recall their experience in the past 12 months, with the possible answers being “Yes” and “No”. A more refined version of these questions would be to offer an ordinal scale such as “Never/Sometimes/Always”.

I did not assess test-retest reliability and I was not able to assess responsiveness and cross-cultural validity because this study only represents a snapshot of the status of access to healthcare in the given population. These are among the limitations that call for further research and validation of Access-31 (Mokkink *et al.*, 2010; Beaton *et al.*, 2000).

In calculating the summary score of Access-31, it was assumed that all questions were of equal importance. Hence, composite access was the sum of the individual item scores. If the domains or items are in fact different in their importance as regards access, then these underlying assumptions are invalid. This assumption cannot, however, be validated here. Pesudovs *et al.* (2007) argue that the use of a statistically-derived scoring method is more likely to generate valid scoring, and further research is certainly required in this area.

Reliability and validity are usually measured through a battery of tests. In this thesis, the aim was not to measure the complete set of validation indices, even though face and content validity were measured, as well as internal consistency. It was not possible to calculate concurrent or predictive validity indices because I was not able to identify another criterion (current or future) for accessibility at the time of the survey, and neither was it feasible to measure responsiveness, as this requires more than one measurement. Similarly, Access-31 is to my knowledge the only patient-reported questionnaire that measures access

to healthcare on the six domains of Access-31, and thus it was not possible to measure convergent or discriminant validity, and time limitations made it impossible to measure test-retest reliability (DeVon *et al.*, 2007; Kievit *et al.*, 2014). In future research, it is important to consider measuring the validity and reliability of Access-31.

6.3.4. Limitations of qualitative research

- **Risk of confirmation bias**

Confirmation bias occurs when qualitative data interpretation is guided by preconceived beliefs of the researcher (Allahverdyan and Galstyan, 2014). In this research I developed the domains and questionnaire from the concept analysis and then carried out the qualitative research with the objective of confirming the findings, adding relevant domains, if any, and assessing the face and content validity of the questionnaire items.

On one hand, the methodology adopted is consistent with the research objectives, as qualitative enquiry is one recommended stage of questionnaire validation. On the other hand, my knowledge of the concept analysis findings and the pre-constructed questionnaire while carrying out the qualitative component may have entailed a risk of confirmation bias. At the beginning of each qualitative session, I asked open-ended questions with the hope of reducing acquaintance bias, but nevertheless I cannot exclude the possibility that my prior beliefs regarding access domains may have guided data interpretation by missing out some relevant points.

- **Selection bias**

I and the contact persons at each health centre selected focus groups and semi-structured interview participants by way of convenience sampling. This method may have been a source of selection bias towards cooperative patients, those with good relationships with the nurses, and frequent attenders. Selection bias is of concern if the research sample has the effect of deviating the outcome from its true value (Collier and Mahoney, 1996). In

this research, the primary objective was to test participants' understanding of the study instrument, and the secondary one to explore their experience of diabetes.

It is unlikely that such bias compromised the value of the results as regards the first objective. The responses from the focus groups and interviews were used to modify the study tool, and the latter was applied to the cross-sectional study participants. A quality assurance person called each participant in the pilot study and 5% of the respondents in the main survey to ask about their experiences answering the survey, including whether they found the questions easy to understand. The responses for these quality assurance questions confirmed that all the questions were clear, and consequently this outcome can be safely generalised.

Although every effort was made to ensure maximum variation and to include patients from various backgrounds in the focus groups and interviews, the risk of selection bias remains high (Robinson *et al.*, 2014). Because cooperative, frequent visitors to the health centres are more likely to have a favourable experience of the service, this may steer the results towards a more positive opinion, which reduces the representation of those with a poor experience or who do not enjoy the same level of rapport with health centre staff.

- Transcription and coding of data

For high-quality coding of qualitative research, research should be coded by two individuals (Burla *et al.*, 2008). Because of the nature of this study as DPhil research, no other coder was used. This may have impacted the interpretation of the qualitative component results, especially given the issue of reflexivity, as will be explained shortly.

- Language of coding

I ran the focus groups and interview sessions and then transcribed them in Arabic, after which I carried out coding and analysis in English. According to Green and Thorogood (2014), the language used is not only a way of collecting the data, but in qualitative research

it is the data itself, and so it was important to analyse the original text in order to capture the maximum amount of data. Transcribing the interview sessions in Arabic preserved the original data, but its subsequent coding in English may have limited the interpretation. Suh *et al.* (2008) recommends translation during analysis, as opposed to before or after analysis, which I found to be the best approach to capture the meaning of the text to the greatest extent possible and to prevent loss of valuable data.

My fluency in both Arabic and English and the need to report the data in English, a language different from the one in which the interviews were conducted, enabled me to manage the data at all stages, including transcription, coding and reporting, but this may have created another source of bias, namely reflexivity. I shall discuss this in the following section.

- Reflexivity

Findings of qualitative research are influenced by context and by the relationship between the researcher and the participants. Age, socio-economic status, and whether the researcher is an insider as regards the research topic are all important, and therefore the researcher should explore the findings not only from a theoretical perspective but also taking into consideration their own role in the study. This is called reflexivity (Dodgson, 2019).

My status as a middle-aged woman with a senior position at the Ministry of Health and more than 25 years' experience working closely with the health system, along with a presence in civic society circles and on social media and a recognised family name, are all factors that require consideration when interpreting the qualitative component of this research. These factors may have impacted the level of interaction between myself and the interviewees, and it is also possible that my background and values influenced how I interpreted and coded the data.

In order to document my interaction with the participants, I maintained a logbook in which I described the proceedings of the focus groups and semi-structured interviews. I shall now detail some observations and attempt to explain how these might have limited or altered the findings of this study.

- Personal involvement

In one focus group in Al-Batinah North, the participants identified me by family lineage. Under the false assumption that I was in a position to change the status quo, the group was extremely vocal and critical of health services, telling several stories about their bad experiences receiving care. I believe that my presence acted as a motivator to elaborate on the issues. I tried to inform them that I was in no position to change anything, but that I could convey their message to senior management.

In another group, one parliamentarian who knew me as a child was selected to participate. In the middle of the conversation, he recognised me. At that point, his approach to answering the questions changed, and he became more paternalistic and less open to sharing personal experiences. As the senior person in the group, his reluctance to respond to questions influenced other members, and the interaction level of that group was thus limited.

In most of the focus groups, there was some hesitation when it came to commenting on the sexual function module of Diabetes-39. In some groups, indeed, women covered their faces when those questions were asked. One woman stated that her husband was not present. The information obtained on this module is therefore quite limited, and as such it warrants more in-depth research.

- Underlying assumptions

Palaganas *et al.* (2017) pointed out that underlying assumptions behind the research hypothesis could influence the interpretation and results of qualitative research. This

research was based on several assumptions. The first of these was that the respondents were aware of the meaning and interpretation of access to healthcare and quality of life, an assumption that during the discussions was proved to be wrong, as several groups said that they did not know what these terms meant. Having stated that, the meanings and interpretations of access in the qualitative component of this research were drawn from the contributions of a small number of participants.

Secondly, I did not investigate participants' knowledge of the structure of healthcare in Oman, or how they viewed public healthcare in general. This constitutes a limitation that could have been avoided. For example, the discussions showed that for the most part participants did not differentiate between primary and secondary healthcare, and a general discussion of this aspect before each session would have helped to develop a deeper understanding of access.

Another assumption here is that of commonality in understanding the terms and phrases used by the participants (Green and Thorogood, 2014). Although Arabic is my mother tongue, some slang words and colloquial terms could give rise to different interpretations. Some proverbs used by the participants were unclear, for instance, and I had to probe for clarification. Similarly, some terms might have seemed clear, when in fact the interviewees had a different interpretation than the one I understood.

6.3.5. Limitations of the cross-sectional survey

- **Access-31 development and choice of questions**

For statistical analysis, I developed a coding scheme for Access-31, running frequency analysis for all questions and then selecting relevant ones for scoring. I deleted some questions because they did not contribute to the evaluation of access. For example, the purpose of the question "Were you referred to a specialist in the last 12 months?" was

to screen those participants eligible to answer the following question: “How long did it take you to see a specialist?”.

Frequency analysis revealed some questions with response rates of less than 50% because the questions were not applicable. This was particularly the case with the question about the time required to contact the health centre (63% respondents said they never tried to call), and the question on needing healthcare in the case of injury (which applied to only 30%). One criterion for the selection of items in survey questionnaires is that all questions should apply to the majority of the respondents, and for that reason I removed these two questions from the analysis (Pesudovs *et al.*, 2007).

- Response rate and non-response bias

Non-response bias is when non-respondents exhibit different characteristics from respondents in a way that might alter the findings of a survey (Centre For Evidence Based Medicine, 2020). High non-response rates, 56% in this survey, are common in online surveys (Nulty, 2008), and this also results in increased standard error of the estimates and non-response bias. It is noteworthy, however that poor levels of response do not necessarily translate into non-response bias, as this will only happen if the variables of interest are systematically different in the two groups (respondents and non-respondents) (Brick, 2013). For example, it is assumed that non-respondents were older and had poorer access to healthcare and quality of life than respondents, but anecdotal observations from the field point to the opposite, as some individuals who were highly educated declined to participate in the survey. This group is likely to experience better quality of life and have better access to healthcare. Because it is not possible to determine in what way respondents are different from non-respondents, the direction and magnitude of non-response bias is difficult to evaluate.

It is possible to adjust for non-response bias by improving response rates during data collection or through statistical methods (Roderick, 1986). In this survey, telephone and text message reminders were sent to non-responders every week for three months, which marginally improved the response rate, and weighted analysis was done as a sensitivity analysis to assess non-response bias.

During analysis I found that the response rate was significantly different between governorates, but this was not the case when I compared the group with glycated haemoglobin (<6%) with the group with high glycated haemoglobin ($\geq 6.5\%$) (P-value>0.5). I could not, however, rule out the possibility of non-response bias, and for this reason I ran weighted analysis of Access-31 using a sample-based method in which the weight of each observation was the reciprocal of the response rate for the governorate of the respondent (Lynn, 1996; Holt and Elliot, 1991). Results revealed that non-weighting underestimated problems in access by only a small degree, between 0 and 5% (Appendix 13).

One limitation of weighted analysis is that it increases the variance of the mean estimates, which reduces the power to detect associations between variables. Weighting should also ideally consider all sources of bias such as age, education, residence, etc., as if one or more of those is neglected, this might underestimate the effect of non-response bias. For instance, if non-respondents were older than respondents in this survey, weighting the analysis by governorate could produce biased results that do not consider age within governorate. The direction of this bias remains unknown, however, because we cannot confirm whether non-respondents are in fact older or more educated (Lynn, 1996).

I was unable to acquire data for non-respondents because ethical standards of research require that each individual consents to their data being shared, which was logistically not possible, and similarly I did not compare the study population with the

general Omani population because the two groups exhibit different characteristics. For example, the mean age for the participants in this survey was 55 ± 12.86 years old, comparable with Elliott *et al.* (2013), who conducted a sample survey on 309 diabetic patients attending PHC in Oman, out of whom 87% were over 40 years old, and Morgan *et al.* (2019), who reported that 8.1%, 21.4% and 18.3% of self-reported diabetics in Oman were in the age groups 40-49, 50-59 and 60+ respectively. According to Ministry of Health records, on the other hand, 81% of the general Omani population is below the age of 40 (Department of Health Information and Statistics, 2019).

In summary, non-response does represent a limitation in this survey, but it cannot be determined whether it resulted in significant non-response bias, and if so in what direction. Adjustment during data collection and analysis was attempted, and the analysis showed limited differences between weighted and non-weighted results, but this cannot confirm that non-response bias is low because of the lack of availability of data concerning non-respondents.

- Sampling

During the sampling of institutions for the cross-sectional study, I merged the sampling units for some governorates with similar characteristics and created sampling clusters. This is an acceptable approach which has the advantage of reducing the time and effort required for a random sample. I chose not to consider each governorate as a cluster because of similarities in some key parameters (Section 3.3.1). This methodological approach is not expected to influence the results of the study. I ran regression analysis using both the governorate and cluster as confounders, and the findings were similar (data not shown).

- **Questionnaire design**

Nine items in the Access-31 questionnaire asked about respondents' experiences in the last 12 months. Respondents may find it hard to recall events over the last 12 months, and this may be a source of recall bias or simple inaccuracy, but in my view it is not a major issue (Althubaiti, 2016). The diabetes management protocols published by the Omani Ministry of Health recommends 2-4 visits annually for each diabetes patient, and therefore recall of shorter time frames may not generate enough information (Ministry of Health, 2015). In future research, though, it might be advisable to replace the opening statement "In the last 12 months" with "The last time you visited", in order to improve consistency and reduce the likelihood of recall bias.

- **Combining pilot and main survey data**

In this section I shall discuss the reasons for including the pilot survey data in the analysis. Thirty participants were included in the pilot survey to assess the feasibility of the study protocol, including recruitment, ease of access and filling in the questionnaires. During this phase, each participant was contacted to obtain feedback, and after this a few modifications were made to the questionnaire, specifically changing the coding for the quality of life responses from numeric to verbal to make them easier to understand. The "must enter" control answers were also removed from the income and quality of life questions.

In the pilot survey, participants who did not understand the quality of life response codes gave up on the survey before completing it, and the quality of life component was missing for those entries. For this reason it may be deduced that the difference in responses to Diabetes-39 between the pilot survey and the main one is not a significant source of bias. Based on the recommendations of the available literature, the sampling frame and protocol

used for the pilot survey and the main survey were similar enough to combine their data (Thabane *et al.*, 2010; van Teijlingen and Hundley, 2002).

- Choice of Likert scale response options

Based on the feedback from the qualitative component and pilot survey participants, I changed the Likert scale from numeric to verbal (Vagias, 2006). The Likert scale typically uses five, seven or nine items, and is common in psychometric studies that measure the attitudes or feelings of participants. The original tool developed by Boyer and Earp (1997) used a modified visual analogue scale where the respondents had to place an X on a line ranging from 1-7, with extreme values labelled “not affected at all” and “extremely affected”. The authors did not, however, explain their reasons for choosing such a method. It is generally assumed that a numeric scale is easier to interpret, but I found this to be untrue, as extreme values were unclear to the participants in this survey, and neither were they able to interpret and respond to the middle range of the scale. Lee *et al.* (2002) observed similar findings in their study involving Japanese individuals, who reported difficulties in understanding the Likert scale more often than Americans did.

Several studies have shown that verbal scales offer a good standard of reliability and can be used interchangeably with numeric scales (Lansing *et al.*, 2003; Phan *et al.*, 2012), while others suggest the opposite (Kliger *et al.*, 2015). As such, the appropriacy of using a verbal scale could depend on the data collection context and purpose of the scale. For the purposes of this survey, I found that the use of a verbal scale was appropriate for the population of interest, but further research is needed to confirm its value in other contexts.

- Selection bias

In health research, the aim is always to obtain precise and accurate results. Systematic error or bias is when some feature of the study generates inaccurate results

(Dohoo, 2014), and at least 70 types of biases have been reported in the literature (Delgado-Rodríguez and Llorca, 2004) .

Because the study was carried out in a primary healthcare setting, the respondents were individuals who had already initiated contact with the health service. One limitation of this study is that it does not provide information on people who did not visit primary healthcare facilities, a common issue in health systems research (Hirmas *et al.*, 2013). In terms of this survey, this group includes non-Omanis, an affluent segment of the population, and patients who for whatever reason did not contact primary healthcare facilities.

Despite the wide coverage of government-funded health services in Oman, wealthier patients remain more likely to use private healthcare providers. This study focused on diabetic patients using public primary healthcare facilities in Oman, and its findings cannot therefore be generalised to all nationals or residents in Oman (Department of health information and statistics, 2013).

Expatriates in Oman make up more than 40% of the population, whereas only 5% of the respondents in this survey were expatriates. The government does not offer expatriates free medical services, and many do not have health insurance. This may be a source of bias, and for this reason the findings of this study cannot be generalised to all residents of Oman.

- Variability in HbA1c measurement methods and dates

HbA1c values were obtained from patients' medical records. The time between the laboratory test and data collection ranged between 0 and 2 years, and I enquired about HbA1c analysis methods with policymakers at the Ministry of Health, whereupon I was informed that testing varies according to the governorate. Only a handful of institutions

have internal and external laboratory quality assurance schemes¹¹. Variability in the estimates of the regression analysis relating access and quality of life with glycated haemoglobin levels may be amplified by several factors, and this could possibly reduce the likelihood of detecting an association. Among the factors that may be implicated in this variability are glycated haemoglobin testing methods, interference from haemoglobin variants, and time since last measurement (Little and Roberts, 2009; Banerjee, 2014).

- **Attrition and careless responding bias**

Because the cross-sectional study was carried out via an online platform, it is prone to biases related to attrition and careless responding. Attrition refers to withdrawal before completing a survey, and careless responding is defined as intentional or unintentional lack of sufficient effort in responding to the survey questions (Ward *et al.*, 2017). In the cross-sectional component of the study, the total number of respondents was 820, of whom 13 did not respond to the last section of the questionnaire. However, 227 participants did not answer the questions on sexual function in the HRQOL tool. The attrition rate is therefore low in this study, but it is difficult to draw any conclusions with regard to careless responding bias. Careless responding could be a source of bias, and it is difficult to measure its impact on the findings of the study.

In addition, I did not account for certain important confounders such as duration of disease, comorbidities and presence of complications (Tonetto *et al.*, 2019; Jing *et al.*, 2018), which are also associated with HbA1c (Badedi *et al.*, 2016). This limitation may influence the internal validity of the findings in the cross-sectional survey.

¹¹ Personal communication, Dr Ahmed Al Wahaibi, Director of Primary Healthcare.

- **Hierarchical modelling**

Hierarchical analysis is recommended for multi-level cluster sample surveys and it differs from non-hierarchical regression analysis in that the latter assumes that all observations are independent and does not take into account variance between and within groups. I sampled individuals within governorates and used stepwise regression analysis. As shown in Tables 27-29, Model 2 included governorate as a control, and in Model 3 individual-level confounders were added to the analysis. These two steps ensured that variability between governorates was taken into account when calculating the regression estimates (Nezlek, 2008).

The recommended hierarchical regression analysis is offered by the mixed methods module in SPSS (Garson, 2013). Applying hierarchical modelling to the logistic regression in 27-29 requires statistical analysis expertise beyond the scope of this research, however, owing to the large sample size (820) and small number of groups (nine governorates). Stepwise analysis and hierarchical linear modelling produce similar data, and therefore it is my belief that these statistical methods are appropriate for the research objectives (Nezlek and Zyniewski, 1998).

- **Multiple testing**

The large number of associations in Chapter 5 could increase the chance of type 1 error, which is 5% for a single analysis, but increases significantly when multiple tests of associations are applied to the same data set. In this research I tested multiple outcomes and predictors, and therefore the probability of rejecting a null hypothesis when it is true is high. I took this fact into consideration, and used hypothesis-driven analysis and inspected P-values and effect size pattern when interpreting the results (Sainani, 2009).

To illustrate my point, I shall discuss the results of Tables 24-29 of the regression analyses. First, in Table 24, I investigated the association between quality of life domains

and governorates controlling for access in the hope that access would explain the variability in quality of life, which did indeed prove to be the case. Although the P-values were much lower than 0.05, the effect estimates were too low for them to be clinically significant, and the directions of estimates were inconsistent, as some effects were positive and others negative, raising the doubt as to whether these associations were true or only down to chance. The likelihood that some of the significant associations in the table might be false positives may support my hypothesis that access, rather than governorate, explains much of the variability in quality of life.

Table 26 shows the association between glycaemic control and governorate, controlling for access. In this Table the ORs were 5 and above, with p-values approaching zero in many instances where there were significant associations, and all of these associations were in the same direction and consistent with the hypothesis. The same is true for Tables 27 and 28.

I did not, however, apply methods for adjusting for multiple analysis problems such as the Bonferroni correction and the false discovery rate (Ranganathan *et al.*, 2016). It is my belief that the results of the analysis are valid by virtue of the considerations explained earlier, though of course this can only be verified through further research on the topic.

6.4. Recommendations

6.4.1. Research recommendations

This research aims to contribute to the advancement of knowledge regarding access to healthcare and universal health coverage. It does, however, raise questions that call for further exploration. Firstly, is this really a comprehensive inventory of the dimensions of access, or are there perhaps other dimensions that may be relevant to other countries and regions of the world? Secondly, does the Access-31 questionnaire sustain its reliability and validity across cultures and countries? Are the domains included sufficient, and are they

all-important for the overall access construct? There is also the question of floor and ceiling effects and the elasticity of those variables, and the validation of the cut-off values suggested for waiting times is also important, as these are based on personal judgement of what constitutes a reasonable waiting time.

In the process of this work, I have identified a number of knowledge gaps. Evidence relating access, quality of life and HbA1c is at best scarce. The relationship between universal health coverage and clinical outcomes, too, is an important factor in guiding policy decisions, such as which domains are relevant to clinical outcome and to the patient's quality of life. In the context of Oman, the availability of services and medicines was the key element, but other domains may be of greater importance in other settings.

Future research should consider addressing the gaps found in the design of the Access-31 questionnaire, namely removing the double-barrelled question and replacing the recall period of 12 months with "in the last two visits". Building on this work, further research to develop a valid and reliable multi-dimensional tool for measuring access to healthcare could prove extremely useful for both policymakers and international agencies.

6.4.2. Policy recommendations

Despite its methodological limitations, this study provides an insight into our understanding of access to healthcare. On this basis, the government of Oman may find it helpful to use these results to improve access and equity in the distribution of services.

Some of the areas raised here, such as access to information and the availability of services, are problematic across all governorates in Oman, while others appear to be more concentrated in certain governorates, like organisational and geographical access. In any case, in-depth assessment and intervention are required if equal access for all is to be ensured.

In addition to these accessibility issues, levels of glycated haemoglobin were inconsistent across different governorates, and therefore more concerted efforts to improve diabetes management and to identify causes is warranted.

To sum up, the Access-31 questionnaire is a tool which has shown a promising degree of reliability in measuring access to healthcare, and further exploration of the validity of this tool and of its value in cross-country comparisons may prove to be a valuable instrument for UHC.

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