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First population-based study on non-communicable diseases and risk factors in northeastern Iran: Sabzevar cohort profile

Fereshteh Ghorat,[1] Reza Chaman,[1] Seyed Alireza Javadinia,[1] Mojtaba Rad,[1,2] Mohammad Mohammadzadeh,[3] Kazem Hassanpour,[4] Elaheh Foroumandi ,[5] Milad Nazarzadeh ,[6] Mohammad Hossien Saghi,[7] Mohammad Salari,[7] Zeinab Bidel,[8] Sareh Eghtesad,[9] Ali Gohari,[5] Zahra Mohammadi,[9] Roholla Borghabani,[5] Mohmmad Mahdi Ghorbani ,[7] Alireza Moslem,[1] Somaye Norouzi [1]

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For numbered affiliations see end of article.

Correspondence to
Dr Somaye Norouzi; norouzis921@gmail.com and Dr Alireza Moslem; alirezamoslem@gmail.com

ABSTRACT

Purpose Non-communicable diseases (NCDs) have become the leading cause of mortality globally, with a sharp rise in Iran due to lifestyle changes and urbanisation. Although many NCD risk factors are modifiable, limited understanding of their determinants hinders effective prevention. To address this, the Prospective Epidemiological Research Studies in Iran (PERSIAN) Cohort was established in 2014 to study NCDs nationwide. The Sabzevar PERSIAN Cohort Study (SPECS) is the first in northeastern Iran, aiming to investigate environmental and social factors influencing NCDs in a unique regional context.

Participants SPECS enrolled 5174 adults (aged 35–70 years) in northeastern Iran between January 2018 and January 2019 through a census and an online registration process. The baseline data collection included demographic verification, informed consent, health questionnaires, anthropometric measurements and biological samples (blood, urine, hair, nails). The annual follow-up began in April 2019, with full reassessments every 5 years over a 15-year period. The data is gathered via an active and passive follow-up, supported by trained staff and registry linkages.

Findings to date Of the 5174 participants, 4241 (81%) remained in the study. Among the cohort, 54.5% were female, with a mean age of 50.5 years. The majority were married (93.5%), and nearly half had at least high-school education (46.5%) and moderate socioeconomic status (49.4%). Drug abuse history (smoking/drugs) was reported by about 15% of the sample. The mean body mass index was 26.9 kg/m², and the average blood pressure was higher in males (118.1/74.0 mm Hg) than in females (111.5/70.2 mm Hg). The common conditions included hypertension (22.8%), kidney stones (22.4%), fatty liver (15.4%) and diabetes (13.8%). Cancer had the highest treatment rate (100%), while fatty liver had the lowest (70.1%). Stroke had the highest mean age of onset (51.2 years), and epilepsy the lowest (23.7 years). All health data were self-reported.

Future plans SPECS, part of the national PERSIAN cohort initiative, is the only adult NCD-focused study in Khorasan Razavi. Its 15-year follow-up aims to generate region-specific insights into the incidence of NCDs and their risk factors. The ethnically homogeneous sample enhances statistical power, and the findings may inform culturally tailored health policies. While self-reported data have limitations due to bias, high initial participation and access to free healthcare support long-term engagement, especially among lower-income groups.

STRENGTHS AND LIMITATIONS OF THIS STUDY

⇒ *Regional specificity*: Sabzevar PERSIAN Cohort Study is the only cohort study in Khorasan Razavi with a focus on adults over 35 years, offering unique insights into non-communicable diseases in this province.
⇒ *Ethnic homogeneity advantage*: A relatively uniform population increases the statistical power to detect associations and outcomes relevant to the region.
⇒ *High participation and accessibility*: Strong initial enrolment and free healthcare services help ensure the inclusion of individuals of a lower socioeconomic status.
⇒ *Self-reporting bias*: Reliance on self-reported data may introduce social desirability bias, affecting the accuracy of health-related variables.
⇒ *Health-conscious participant effect*: Long-term participants may adopt healthier behaviours, limiting generalisability to the broader population.

INTRODUCTION

Non-communicable diseases (NCDs), such as cardiovascular disease, cancer and type 2 diabetes, have risen sharply in Iran and globally over the past three decades.[1] Currently, NCDs account for nearly 79% of mortalities in developing countries and more than 85%

of the global disease burden.[2] About half of these mortalities occur prematurely, between the ages of 30 and 70 years.[3] The WHO has identified the epidemic of NCDs as a major public health challenge of the 21st century, with devastating health and economic consequences.[4]

NCDs arise from both unmodifiable risk factors (such as age, sex and genetics) and modifiable ones, including sedentary lifestyle, poor diet, stress, limited access to health services, occupational and environmental exposures, smoking and alcohol consumption.[5–7] In many developing countries, rapid urbanisation and lifestyle transitions have accelerated the shift from infectious diseases to NCDs.[8] Despite the recognition of these risk factors, the multifactorial nature of NCDs means that their causes remain poorly understood. The lack of knowledge contributes to rising prevalence and the growing social and economic burden.[9–11]

To address this gap, the Prospective Epidemiological Research Studies in Iran (PERSIAN) Cohort was launched in 2014 as a large, multicentre study including over 180 000 participants aged 35–70 years.[12 13] The cohort was designed to investigate the prevalence and determinants of NCDs across diverse regions of Iran. Within this framework, the Sabzevar PERSIAN Cohort Study (SPECS) was established to explore how geographical, cultural and social factors influence NCD development in northeastern Iran.

To date, no population-based cohort study has been conducted on NCDs in northeastern Iran (Khorasan Bozorg) or among the Khorasan ethnic group. Given that disease development mechanisms may be influenced by geographical, cultural and social factors, it is essential to conduct comprehensive and prospective studies in Khorasan region. Specifically, SPECS aims to:

- Identify environmental risk factors for common NCDs.
- Comprehensively assess external exposures and lifestyle factors, including dietary patterns.
- Examine social determinants, ethnic background and individual-level factors that influence disease mechanisms.
- Provide a model for population-based studies of causal pathways in disease development, leveraging natural environmental and social transitions in rapidly changing regions to strengthen causal inference.

With a focus on these research questions, SPECS contributes to a deeper understanding of NCD determinants and informs strategies for prevention and control in Iran and similar countries.

COHORT DESCRIPTION

Why is this cohort study set up in Sabzevar?

Sabzevar, the capital of Sabzevar County, historically known as Beyhagh, is in Khorasan Razavi Province. The city covers an area of about 37.5 km^2 with an approximate population of 243 700 in 2016, ranking the 34th most populous city in Iran[14] (see figure 1). It is historically recognised as the second most prominent city in the greater Khorasan region.[15] Sabzevar lies between the metropolises of Tehran and Mashhad, serving as a key communication hub in eastern Iran, and is regarded as one of the cleanest and most oxygen-rich cities in the country.[14] The city is enclosed between northern and southern highlands; its eastern and northern regions are mountainous with a temperate climate, while the plains experience warmer weather.[15] Two seasonal rivers, including the Kal-Shor, flood directly from the Sabzevar plain to desert salt flats.[15] Sabzevar is also recognised as a major centre of population, academia, culture, commerce, communication, Islam and history in eastern Iran, with scientific and academic institutions boasting a longstanding heritage.[15] Additionally, the city serves as a commercial hub for agricultural products, particularly saffron, cumin and pistachio.[15]

Who is in the cohort?

Study design, sample size, eligibility criteria and procedure description

The SPECS is an open, prospective, population-based cohort study conducted between January 2018 and January 2019, in which adults aged 35–70 years were recruited. The eligibility criteria consisted of residence in Sabzevar for at least 1 year, anticipated continued residence, and willingness to participate, written informed consent, and the ability to communicate with the research team, along with the verified Iranian citizenship through a national ID card and birth certificate. The exclusion criteria consisted of individuals with severe physical or mental disability preventing participation, unwillingness to provide biological samples or inability to complete baseline assessments.

To ensure the representativeness of sample, the research team conducted a comprehensive census. A trained research assistant, proficient in the local Sabzevari dialect, performed a door-to-door survey across 10 blocks of the region (Towhid-Shahr of Sabzevar) and explained the objectives of study, recorded home addresses, collected phone numbers from individuals who agreed to participate and assigned a unique code to each resident. Additionally, individuals received a personal invitation with a scheduled appointment at the cohort research centre. They could also register on the cohort centre website, providing key demographic and contact details, including the name, national code, gender, phone number, preferred contact time and email address.

Upon registration, the participants were contacted to confirm enrolment and provide further instructions for participation. They were then given comprehensive information about the objectives of project, along with educational pamphlets outlining all procedural steps. These materials clarified standard testing conditions, including the definition of ‘fasting’ for blood and urine sampling or nail and hair sampling. To verify their demographic information, participants

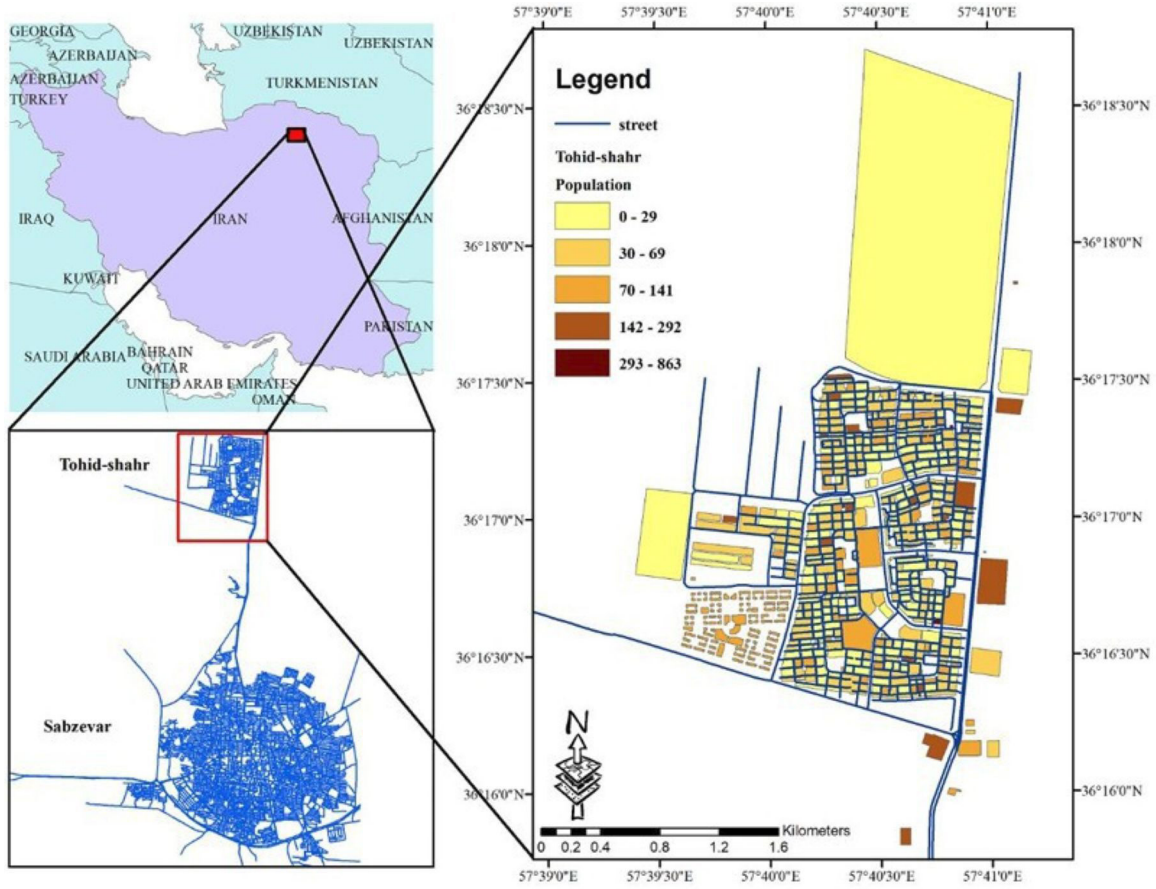

Figure 1 Geographic location of Sabzevar in northeastern Iran, with selected districts forming part of Sabzevar PERSIAN Cohort Study (SPECS) (population density: 7861 people/km^2).

were required to submit copies of their birth certificates and national identification cards on the day of their visit to the centre.

To establish an adequate sample size for statistical analysis, the PERSIAN Cohort Central Scientific Committee determined the number of participants for each PERSIAN cohort site, ensuring an optimal statistical power. Considering the available resources and in agreement with the committee, it was decided to include 5174 participants to adequately represent the population. Approximately 972 individuals declined participation, resulting in a participation rate of 81.21%. Participants withdrew from the study for various reasons, including reluctance to continue, mortality and non-responsiveness to phone calls. All the staff in this research, physicians, interviewers, laboratory technicians, executive managers and receptionists, were selected from local applicants through structured interviews conducted by the principal researcher. The central committee of the PERSIAN Cohort managed the recruitment process.

How often have they been followed up?

Annual follow-up

The annual follow-up of the SPECS study began in April 2019. During this phase, each participant is contacted and interviewed on phone on an annual basis. The follow-up strategy enjoys both active and passive approaches to improve data collection and enhance analytical insights. In cases of mortality, a verbal autopsy form is completed[13] (see figure 2). The 6th wave of follow-up has begun and is not finished yet.

Active and passive follow-up process

Telephone interviews are conducted to update health status, hospitalisation and major events. During the active follow-up, blood samples will be promptly collected from individuals experiencing significant health events (eg, hospitalisation for NCD). In addition, assessment by an internal medicine specialist will be conducted to ensure clinical validation. During passive follow-ups, the selected data will also be obtained through linkage with external databases, such as mortality and cancer registries.[13]To address potential recall bias in reporting outcomes of interest, participants are asked to provide the follow-up team with their relevant medical documents. All documentation will be verified by a physician.

Reassessment process

Every 5 years over a 15-year period, participants will undergo face-to-face reassessments that include repeated questionnaires, physical examinations and

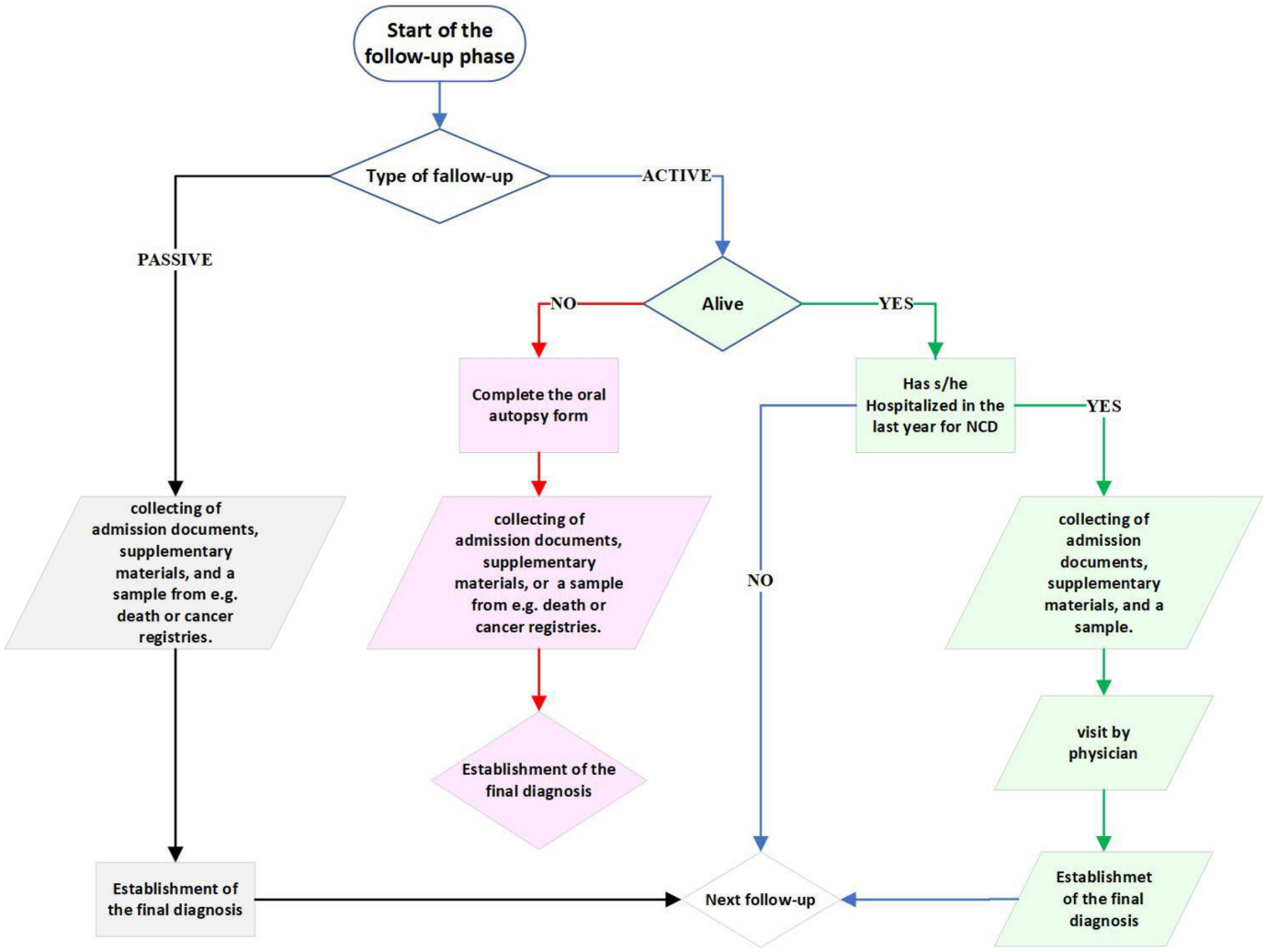

Figure 2 Algorithm of the annual follow-up of Sabzevar Prospective Epidemiological Research Studies in Iran (PERSIAN) cohort study. NCD, non-communicable disease.

biological sample collection (blood, urine, hair and nails). All samples will be processed using standardised protocols of the PERSIAN Cohort and stored in biobank facilities for future analyses.[13]

Strategies to minimise dropout?

To minimise the participant dropout, several measures have been taken:

- Regular annual contact as phone interviews to sustain engagement.
- Flexible scheduling and reminders for baseline and follow-up visits.
- Clear explanation of benefits and procedures of study at enrolment and during follow-up.
- Confidentiality of data and participant comfort during data and sample collection analysing reasons for withdrawal (eg, mortality, relocation, refusal or non-response) to allow sensitivity analyses.
- Passive follow-up via linkage with national registries (mortality, cancer) to reduce the loss of outcome data even if participants discontinue active participation.

What has been measured?

The data have been collected via several questionnaires, including general, medical and nutrition questionnaires,[16] alongside bio-sampling, including blood, urine, hair and nail samples and anthropometric measurements (see online supplemental 1).[13] All data and sample collection have been performed by trained interviewers and laboratory technicians. Clinical history data are self-reported, except for diabetes and hypertension. The definitions and prevalences of these two diseases are presented elsewhere.[17 18]

Questions regarding personal information, socioeconomic status, lifestyle and environmental and occupational exposures

Socioeconomic, lifestyle and nutrition data were gathered through interviews conducted by trained staff prior to clinical examinations and following biological and tissue sampling. The objective is to collect data on demographics, personal information, socioeconomics, lifestyle factors and environmental and occupational exposures (table 1: Section 1).

Table 1 Assessment measures: baseline and 5-year intervals (all items extracted from data dictionary for baseline variables in PERSIAN cohort)

Domains	Components	Data collection measures and instruments
Section 1: General	Personal information	Such as 'enrolment date, cohort centre ID, gender, age, education years, mother ethnicity, marital status, first marriage age, marriage frequency, family marriage, family status, last education level, work experience'
	Socioeconomic information	Such as 'housing status, house area, number of rooms, family size, access to a (freezer, washing machine, dish washer, computer, own PC, own laptop, own mobile phone, Internet, car, motorcycle, vacuum cleaner, colour tv, frequency of reading books, frequency of travelling abroad)'
	Lifestyle	Such as 'personal habits: cigarette type, smoking history, physical activity, sleeping habits, alcohol consumption, passive smoking, drug abuse'
	Environmental and occupational exposures	Such as 'occupational exposure, mobile use, fuel use and living standards (type of fuel used for heating and cooking), animal contact, pesticide use'
Section 2: Medical	Physical examination	Such as 'stage of hair loss, facial hirsutism, eye colour, physical or sensory disabilities or amputations and spinal disorder, cause of disability, disabled body part'
	Oral health	Such as 'frequency of brushing teeth, total number of teeth, number of decayed teeth, number of missing teeth, any lesions inside the mouth, whether or not the participant flosses the teeth, number of filled teeth'
	Previous medical history	Diagnosed with NCD such as 'diabetes mellitus, hypertension, gestational diabetes mellitus and hypertension, CVD disease, age at the time of NCD diagnosis, rheumatological disorder'
	Signs and symptoms	Having experienced burning sensation, pain, pressure or discomfort in chest while walking fast, or walking uphill, swelling or oedema in any part of body, especially the feet, urine discolouration, shortness of breath and wheezing
	Medication use (past and present)	Such as 'medication name, number of medicines taken per time, the time frame of medicine use, the length of time the medicine has been used'
	Family medical history	Such as 'whether or not any close or distant relatives have diabetes, hypertension, cardiac disease, MI, stroke, cancer…'
	Reproductive history	Such as 'having ever had a menstrual cycle, age at the first menstruation, pregnancy status at the time of enrolment, frequency of prior pregnancies, age at the first pregnancy, frequency of abortions, history of primary infertility and treatment…'
	Contraception history	Such as 'age at the beginning of each entry, age at the end of each entry, type of contraception used, months of using contraception'
	Hormonal replacement therapy	Such as 'age at the beginning of each entry, age at the end of each entry, name of hormonal medication, months of consuming hormonal medication…'
	Disability or amputations	Such as 'the cause of disability, the disabled part of body'
	Blood analysis	Biochemical assessments included fasting blood sugar (FBS), complete blood count (CBC), encompassing haemoglobin, white blood cell count, red blood cell count, platelet count, white blood cell differential, mean corpuscular volume and mean corpuscular haemoglobin concentration, lipid profile analysis, including triglycerides, total cholesterol, LDL cholesterol and HDL cholesterol, kidney function tests (blood urea nitrogen, creatinine) and liver function tests (alanine transaminase, aspartate transaminase, alkaline phosphatase and gamma-glutamyl transpeptidase)
	Anthropometric measurements	The comprehensive body analysis used an advanced bioelectric impedance analyser (BIA), including measurements of height, waist circumference, hip circumference, wrist circumference and full body composition
Section 3: Nutrition	Dietary habits	Dietary habits over the past year and present, water use, local foods
	Food frequency	Food frequency questionnaire (past year)
	Dietary supplements	Taking multivitamin mineral supplements

CVD, cardiovascular disease; HDL, high-density lipoprotein; LDL, low-density lipoprotein; MI, myocardial infarction; NCD, non-communicable disease; PC, personal computer; PERSIAN, Prospective Epidemiological Research Studies in Iran.

Overview of general health and medical history

A physical examination and a face-to-face medical interview were conducted for all participants in a secure, quiet and private environment, during which they responded to questions related to table 1 of Section 2.

Assessment of nutritional status

The PERSIAN Cohort Food Frequency Questionnaire is a dietary assessment tool that includes 113 food items in 9 groups: grains, dairy, meats, fruits and vegetables.[16] It was developed by expert dietitians and adapted from two validated Iranian questionnaires,[19 20] resulting in a more comprehensive yet shorter version. This adaptation helps reduce participant fatigue while ensuring accurate data collection. SPECS also incorporated two locally relevant foods, which were later standardised for analysis. The questionnaire was administered by trained interviewers who followed uniform protocols. Participants reported the frequency of their food consumption (eg, daily, weekly) and portion sizes with the help of visual references, such as food albums and utensils. Daily intake in grams was calculated for each food item based on the reported consumption patterns (table 1: Section 3). The collected information was routinely checked for quality at both central and local levels.

Biological sample collection and analysis: blood, urine, hair and nails

A fully equipped laboratory adhering to standard guidelines was established for the cohort centre. Venipuncture was performed using a vacuum tube in a fasting state (8–12 hours). A total of 25 mL of blood was collected per participant, including a 7 mL clot tube and three 6 mL tubes containing ethylenediamine tetraacetic acid. The clot tubes were then placed at room temperature for 30–40 min under a laboratory hood, followed by centrifugation (SIGMA Laboratory Centrifuge, Germany) at 3000 rpm for 10–15 min at 4°C. Approximately 500 µL of serum was used for blood chemistry tests via a biochemical autoanalyser (BT 1500 Biotecnica, Italy), while the remaining serum, along with the buffy coat, whole blood and plasma, was transferred to 1000 µL cryotubes and stored at −80°C. Storage equipment is monitored continuously with automated sensors, supported by emergency power generators.

Table 2 Baseline demographic characteristics of participants in Sabzevar PERSIAN Cohort Study (SPECS)

		Frequency (%)/mean (SD)		
		Male*	Female*	Total*
General characteristics		n=1894 (44.7%)	n=2347 (55.3%)	n=4241
Socioeconomic level	Low	417 (22.1%)	630 (26.8%)	1047 (24.7%)
	Moderate	1003 (52.9%)	1091 (46.5%)	2094 (49.4%)
	High	474 (25.0%)	626 (26.7%)	1100 (25.9%)
Educational level	Illiterate	130 (6.9%)	427 (18.2%)	557 (13.1%)
	<High school diploma	687 (36.2%)	1023 (43.6%)	1710 (40.3%)
	≥Diploma	1077 (56.9%)	897 (38.2%)	1974 (46.6%)
Smoking history	Yes	629 (33.2%)	21 (0.9%)	650 (15.3%)
	No	1220 (64.4%)	2326 (99.1%)	3546 (83.6%)
	No response	45 (2.4%)	0 (0%)	45 (1.1%)
Drug use history	Yes	562 (30.4%)	79 (3.4%)	641 (15.1%)
	No	1287 (69.6%)	2268 (96.6%)	3555 (83.9%)
Job history	Employed	500 (26.4%)	1903 (81.8%)	2403 (56.7%)
	Unemployed	1349 (71.2%)	444 (18.2%)	1793 (42.2%)
	No response	45 (2.4%)	0 (0%)	45 (1.1%)
Marital status	Not married	1868 (98.6%)	2099 (89.4%)	3967 (93.5%)
	Married	26 (1.4%)	248 (10.6%)	274 (6.5%)
Age		50.5 (±9.0)	48.4 (±8.4)	48.8 (±9.90)
Height		169.8 (±6.6)	156.0 (±5.6)	162.2 (±9.2)
Weight		77.7 (±14.1)	71.1 (±12.1)	74.1 (±13.4)
Body Mass Index (BMI)		26.9 (±4.3)	29.2 (±4.7)	28.1 (±4.7)
Waist–hip ratio (WHpR)		0.9 (±0.05)	0.9 (±0.06)	0.9 (±0.06)

*Male and female column percentages were calculated with denominators n=1894 and n=2347, respectively; total column percentages were calculated with denominator n=4241.

Fifteen millilitres of morning midstream urine were collected in sample cups, with a portion used for baseline urinalysis. The urine analysis was followed by centrifugation at 3000 rpm for 5–10 min. Chemical examination was done with a urine dipstick. After decanting the supernatant, a small volume of 0.2–0.5 mL was intentionally left in the tube. The pellet was then resuspended in this remaining fluid by gently flicking the bottom of the tube. A drop of this resuspended sediment was transferred onto a glass slide, covered with a coverslip, and examined under a microscope. The remaining urine samples are transferred to cryotubes and stored at −20°C. Additionally, 300–500 strands of hair, along with fingernail and toenail samples, were individually wrapped in aluminium foil. Hair and nail samples were stored in a cool, dry environment (table 1: Section 2).

Anthropometric measurements

Anthropometric measurements, including height, weight (kg) and waist, hip and wrist circumferences (cm), were conducted in the morning while the participants were fasting to minimise bias, following the US National Institutes of Health protocols.[21]

Participants removed their shoes, heavy clothing and accessories before measurements. To measure weight and height, calibrated SECA 755 mechanical column scales and SECA 204 mobile stadiometer were used, respectively. Body composition was assessed using an automated bioelectric impedance machine (TANITA Corporation, Tokyo, Serial No: 15120043, 2015) with an integrated audiometer (BSM350). Waist circumference was measured at the narrowest point below the lowest rib and above the iliac crest, hip circumference at the widest part, and wrist circumference on the right arm with the elbow extended, measured at the broadest section above the ulnar bone. A non-elastic tape measure was used without pressure, ensuring a precision of 0.1 cm. Body mass index (BMI) was calculated as weight divided by height squared (kg/m^2). Waist–hip ratio and waist–height ratio were estimated as the waist circumference by hip circumference and height, respectively.

WHAT HAS IT FOUND?

Demographic characteristics

The patients' baseline characteristics are presented in table 2. A total of 5174 participants were invited to join SPECS, with 81% remaining. Ultimately, 4241 participants continued with the study. More than half were female (54.5%). The mean age at baseline in male and female was 50.39 and 48.76 years, respectively. The proportion of married participants was high (93.5%). Almost half of the participants had a high-school diploma or higher education (46.54%) and a moderate socioeconomic level (49.37%). The participants' mean age, height, weight,

Table 3 Baseline clinical characteristics of participants in Sabzevar PERSIAN Cohort Study (SPECS)

		Frequency (%)		
		Male*	Female*	Total*
		n=1894 (43.6%)	n=2347 (55.4%)	n=4241
Clinical characteristics		Mean (SD)		
Blood pressure (mm Hg)	Systolic blood pressure (SBP)	118.1 (±16.3)	111.5 (±15.6)	114.9 (±16.2)
	Diastolic blood pressure (DBP)	74.0 (±9.8)	70.2 (±9.5)	71.9 (±9.8)
Laboratory measurements: blood assay	White blood cells (WBC) count (K/mm^3)	6.4 (±1.6)	6.3 (±1.5)	6.3 (±1.5)
	Red blood cell (RBC) count (K/mm^3)	5.1 (±0.5)	4.6 (±0.4)	4.8 (±0.5)
	Haemoglobin (g/L)	15.0 (±1.2)	13.2 (±1.2)	14.0 (±1.5)
	Plateletcrit (%)	0.23 (±0.04)	0.27 (±0.05)	0.25 (±0.05)
	Mean platelet volume (MPV) (fL)	9.0 (±0.7)	9.1 (±0.7)	9.1 (±0.7)
	Blood urea nitrogen (mg/dL)	14.8 (±3.6)	12.8 (±3.6)	13.7 (±3.7)
	Creatinine (mg/dL)	1.2 (±0.20)	1.0 (±0.23)	1.0 (±0.24)
	Fasting blood sugar (mg/dL)	109.1 (±40.5)	105.6 (±40.6)	107.2 (±40.6)
	The aspartate aminotransferase (AST) (IU/L)	21.7 (±9.2)	18.8 (±8.4)	20.2 (±8.9)
	The alanine aminotransferase (ALT) (IU/L)	26.1 (±17.1)	18.9 (±12.6)	22.1 (±15.2)
Laboratory measurements: plasma lipids	Triglycerides (mg/dL)	161.6 (±124.6)	133.8 (±77.4)	146.2 (±102.1)
	Total cholesterol (mg/dL)	188.3 (±40.6)	194.2 (±39.7)	191.6 (±40.2)
	Low density lipoprotein (LDL) (mg/dL)	48.8 (±9.1)	55.2 (±10.8)	52.3 (±10.6)
	High density lipoprotein (HDL) (mg/dL)	108.5 (±34.1)	112.5 (±33.8)	110.7 (±34.0)

*Male and female column percentages were calculated with denominators n=1894 and n=2347, respectively; total column percentages were calculated with denominator n=4241.
fL, femtolitres; g/dL, grams per decilitre; IU/L, international units per litre of serum; K/mm^3, thousands of cells per cubic millimetre; mg/dL, milligrams per decilitre.

Table 4 Medical conditions, their age of onset and treatment status of Sabzevar PERSIAN Cohort Study (SPECS) participants

	Frequency/mean (SD)		
NCD	Male (n=1894)*	Female (n=2347)*	Total (4241)*
T2DM	265 (14.0%)	320 (13.6%)	585 (13.8%)
Age of onset	47.62 (±9.26)	46.86 (±9.85)	47.18 (±9.59)
Under treatment	234 (88.3%)	295 (92.2%)	529 (90.4%)
Hypertension	358 (18.9%)	609 (25.9%)	967 (22.8%)
Age of onset	48.30 (±9.83)	46.51 (±9.51)	47.19 (±9.68)
Under treatment	322 (89.9%)	562 (92.3%)	891 (92.1%)
Ischaemic heart disease	208 (11.00%)	226 (9.6%)	434 (10.2%)
Age of onset	48.65 (±11.68)	45.90 (±12.05)	47.27 (±11.96)
Under treatment	197 (94.7%)	207 (91.6%)	404 (93.1%)
Myocardial infarction	55 (2.9%)	15 (0.63%)	70 (11.9%)
Age of onset	48.81 (±8.46)	48.06 (±9.59)	48.65 (±8.65)
Under treatment	55 (100%)	14 (93.3%)	69 (98.6%)
Stroke	24 (1.3%)	28 (1.2%)	52 (1.2%)
Age of onset	54.33 (±9.85)	47.85 (±10.9)	51.15 (±11.00)
Under treatment	23 (95.8%)	27 (96.4%)	50 (96.2%)
Renal failure	31 (1.6%)	36 (1.5%)	67 (1.6%)
Age of onset	44.19 (±16.58)	39.61 (±15.84)	42.13 (±16.44)
Under treatment	29 (93.5%)	34 (94.4%)	63 (94.0%)
Fatty Liver	267 (14.1%)	385 (16.4%)	652 (15.4%)
Age of onset	45.25 (±8.44)	46.46 (±8.14)	45.93 (±8.26)
Under treatment	182 (68.2%)	275 (71.4%)	457 (70.1%)
Chronic lung disease	77 (41.2%)	110 (58.8%)	187 (4.4%)
Age of onset	37.64 (±16.78)	36.57 (±13.93)	37.01 (±15.14)
Under treatment	75 (97.4%)	107 (97.3%)	182 (97.3%)
Thyroid disease	85 (19.8%)	345 (14.7%)	430 (10.1%)
Age of onset	43.64 (±11.52)	39.08 (±11.12)	39.98 (±11.33)
Under treatment	74 (87.1%)	319 (92.5%)	393 (91.4%)
Kidney stone	519 (54.5%)	433 (45.5%)	952 (22.4%)
Age of onset	40.01 (±10.82)	40.10 (±11.08)	40.11 (±10.97)
Under treatment	463 (89.2%)	364 (84.1%)	827 (86.9%)
Gallstone	48 (2.5%)	164 (77.4%)	212 (5.0%)
Age of onset	50.97 (±8.78)	44.57 (±10.55)	46.12 (±10.55)
Under treatment	40 (83.3%)	147 (89.6%)	187 (88.2%)
Rheumatic disease	30 (1.6%)	97 (4.13%)	127 (3.0%)
Age of onset	27.3 (±16.85)	34.38 (±16.60)	32.70 (±16.87)
Under treatment	28 (93.3%)	91 (93.8%)	119 (93.7%)
Cancer	14 (0.7%)	41 (1.7%)	55 (1.3%)
Age of onset	53 (±19.87)	46.02 (±11.18)	47.80 (±14.03)
Under treatment	14 (100%)	41 (100%)	55 (100%)
Epilepsy	54 (2.8%)	60 (2.6%)	114 (2.7%)
Age of onset	24.07 (±18.36)	23.33 (±15.16)	23.68 (±16.6)
Under treatment	48 (88.9)	58 (96.7)	106 (93.0)
Chronic headaches	94 (5.00%)	375 (16.00%)	469 (11.1%)
Age of onset	30.48 (±12.34)	30.80 (±11.04)	30.76 (±11.26)

Continued

Table 4 Continued

NCD	Frequency/mean (SD) Male (n=1894)*	Female (n=2347)*	Total (4241)*
Under treatment	83 (88.3%)	332 (88.5%)	415 (88.5%)
Psychiatric disorder	122 (6.4%)	266 (11.3%)	388 (9.1%)
Age of onset	38.77 (±12.03)	38.89 (±11.09)	38.85 (±11.33)
Under treatment	105 (86.1%)	235 (88.3%)	340 (87.6%)

*Male and female column percentages were calculated with denominators n=1894 and n=2347, respectively; total column percentages were calculated with denominator n=4241
NCD, non-communicable disease; T2DM, type 2 diabetes mellitus.

waist–hip ratio and BMI were 50.5 years, 169.8 cm, 77.7 kg and 26.9 kg/m², respectively. Among the participants, 15.1% and 15.3% had a history of drug abuse (cigarettes and drugs) (see table 2).

Clinical characteristics

Overall, the mean systolic and diastolic blood pressures were 118.1/74.0 mm Hg in males and 111.5/70.2 mm Hg in females. Mean values for blood assays and lipid profiles are presented in table 3. The mean fasting blood sugar level was 109.1 mg/dL in males and 105.6 mg/dL in females. LDL and HDL levels were 48.8 mg/dL and 108.5 mg/dL in males, and 55.2 mg/dL and 112.5 mg/dL in females, respectively.

Medical conditions

Regarding the participants' previous medical history, hypertension was the most common condition, present in 22.8% of the cohort (n=967), followed by kidney stones in 22.4% (n=952), fatty liver in 15.4% (n=652) and type 2 diabetes mellitus in 13.8% (n=585). Other prevalent conditions included chronic headaches in 11.1% (n=469), ischaemic heart disease in 10.2% (n=434), thyroid disorders in 10.1% (n=430) and psychiatric conditions in 9.1% (n=388). The prevalence of stroke (1.2%, n=52), renal failure (1.6%, n=67), chronic lung disease (4.4%, n=187), gallstones (5.0%, n=212), rheumatic disease (3.0%, n=127), cancer (1.3%, n=55) and epilepsy (2.7%, n=114) was below 10%. Regarding treatment, the lowest uptake was observed in fatty liver (70.1%, n=457), and the highest in cancer (100%, n=55). The earliest mean age of disease onset was for epilepsy (23.7 years), whereas the latest was for stroke (51.2 years). All findings were self-reported, except for diabetes and hypertension, which were objectively assessed (see table 4).

WHAT ARE THE MAIN STRENGTHS AND WEAKNESSES?

The large-scale SPECS, among the cohorts based on the PERSIAN cohort study,[22–31] aims to investigate the incidence of major NCDs and their risk factors in Iran over a 15-year follow-up period. SPECS is the only cohort study conducted in Khorasan Razavi on adults (>35 years) and is expected to produce comprehensive results on NCD outcomes in this province. These estimates could potentially lead to targeted, evidence-based healthcare policies tailored to the local customs and beliefs. Besides, an ethnically homogeneous population will likely offer more power to test different associations and outcomes in this region.

Participants in long-term research tend to be more health-conscious than the general population and may adopt new habits they believe can address their concerns. Additionally, the reference point significantly influences how older adults evaluate their health over time.[12] A notable limitation of this study is reliance on self-reported data, which is subject to social desirability bias, where individuals present themselves in a more favourable light, potentially leading to false or ambiguous relationships between variables.[13] Nevertheless, SPECS achieved a high initial participation rate, and the availability of free healthcare services is expected to enhance participation among individuals of a lower socioeconomic status.

COLLABORATION

The SPECS database is not open access; however, we actively encourage scientific collaboration. Researchers who agree on the terms and conditions of the PERSIAN Cohort Study may request access to data to maximise scientific utility. The data are available to qualified researchers for approved proposals, subject to ethical and regulatory requirements. Access is provided through the SPECS public data archive, which includes information on ongoing proposals and published papers. Detailed instructions on how to request access, along with guidance on permitted uses and restrictions on reuse, are available on our institutional website: https://www.medsab.ac.ir/index.aspx?pageid=6037 and www.persiancohort-portal.com

Author affiliations
[1]Non-Communicable Diseases Research Center, Sabzevar University of Medical Sciences, Sabzevar, Iran (the Islamic Republic of)

[2]School of Paramedicine, Sabzevar University of Medical Sciences, Sabzevar, Iran (the Islamic Republic of)
[3]Cellular and Molecular Research Center, Sabzevar University of Medical Sciences, Sabzevar, Iran (the Islamic Republic of)
[4]Department of Pediatrics, Sabzevar University of Medical Sciences, Sabzevar, Razavi Khorasan Province, Iran (the Islamic Republic of)
[5]Sabzevar University of Medical Sciences, Sabzevar, Iran (the Islamic Republic of)
[6]Sabzevar University of Medical Sciences Non-Communicable Diseases Research Center, Sabzevar, Razavi Khorasan Province, Iran (the Islamic Republic of)
[7]Sabzevar University of Medical Sciences, Sabzevar, Razavi Khorasan Province, Iran (the Islamic Republic of)
[8]Iranian Research Center on Healthy Aging, Sabzevar University of Medical Sciences, Sabzevar, Razavi Khorasan Province, Iran (the Islamic Republic of)
[9]Liver and Pancreatobiliary Diseases Research Center, Tehran University of Medical Sciences, Tehran, Iran (the Islamic Republic of)

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ORCID iDs
Elaheh Foroumandi https://orcid.org/0000-0003-1600-747X
Milad Nazarzadeh https://orcid.org/0000-0002-0576-8874
Mohmmad Mahdi Ghorbani https://orcid.org/0009-0002-3643-8680
Somaye Norouzi https://orcid.org/0000-0003-1695-3810

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