

1 Title page

2 Title: A review of medical problems in Himalayan porters

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41 Abstract

42 Porters have accompanied trekkers and climbers to high altitude since the earliest expeditions in
43 the Himalayas. As the existing body of knowledge on high altitude medicine expands, the focus
44 remains on trekkers or climbers and published literature on medical problems in the large porter
45 population remains sparse. It is well known that porters working at high altitude in the Nepal
46 Himalayas are often lowland dwellers and are as prone to high altitude illnesses like acute
47 mountain sickness (AMS), high altitude pulmonary edema (HAPE) and high altitude cerebral
48 edema (HACE) as the trekkers. Other illnesses like diarrhea, respiratory illnesses and infections
49 also occur in this population. In this review, studies reporting these findings will be discussed
50 along with the local context of socio-economic barriers to adequate healthcare for these porters.

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61 A review of medical problems in Himalayan porters

62 Ever since the earliest expeditions adventurers sought to explore remote locations throughout the
63 world enlisting the help of locals to carry the loads required. High altitude areas were not exempt.
64 With the first foreigners setting foot in the Himalayas around 1907 (West 1989), a cycle of need
65 was identified. The tourists needed to transport heavy equipment and food through tough terrain
66 and the local population needed to earn money. Thus, started the porter- trekker relationship,
67 both invaluable to each other. As the hikes and treks moved to higher elevations, there was
68 recognition of illnesses related to high altitude. As years have passed, the knowledge about
69 altitude illnesses in trekkers and mountaineers has steadily increased. In most of the studies
70 examining medical problems at high altitude it is the tourist population that has been the focus
71 of scientific work. The population who make travel to such extremes possible by carrying heavy
72 loads, trudge along, seemingly unnoticed and neglected.

73 In this review we will focus on the porters in Nepal, a Himalayan nation famous for high altitude
74 adventure activities. We will focus our discussion on porters from lowland regions trekking to
75 high altitude regions on a seasonal basis.

76 In a poverty-stricken country like Nepal, where 55% of the population live below the
77 international poverty line of US\$1.25 per day (Kalimili 2016), poor people originating from low-
78 altitude areas may be drawn to work as a porter to supplement their subsistence farming and as a
79 means for providing an education for their children. There are multiple health risks that are
80 involved with working as a porter, especially at high altitude (Malville 2001, Bauer 2003, Doocy
81 2007, Koirala 2018). The resurgence in tourist numbers after the 2015 earthquake means the
82 numbers of porters going to high altitude will also have increased (van Strien 2018).

83 In a study of workload trends of 2 high-altitude clinics in Nepal, it was noted that around 40% of
84 patients seen at Pheriche aid post are Nepalese and often porters. With limited education,
85 improper clothing and equipment and very little knowledge of the potential medical problems, it
86 has also been noted that most of these porters reaching altitudes of up to 5600m reside at lower
87 altitude, and may not be well-suited for the hypoxia of high altitude and carrying loads in that
88 environment (Basnyat 1999).

89 Coming from a low socioeconomic background and having to work as much as they can to earn
90 enough, the health seeking behavior of these porters is noteworthy in that they only tend to visit
91 health facilities once they become close to incapacitation. Most porters do not have any form of
92 medical or evacuation insurance when they fall ill during their work. Nepali staff and porters are
93 often reliant on the preparedness and resources of the trekking group to reduce the risk of
94 medical problems. While helicopter evacuation for medical reasons is getting more accessible
95 and often may happen for minor complains in tourists, the porters do not have easy access to
96 medical evacuation (Dawadi, 2020).

97 In a recent survey among porters in the Khumbu by Koirala et al, the lack of knowledge about
98 health issues among porters and how to tackle them at high altitude, carrying more than
99 recommended loads, and financial pressure to complete a trip despite ongoing problems were
100 highlighted. The study also emphasized some common medical problems faced by the porters,
101 which included altitude illness, cough, trauma among others (Koirala 2018).

102 There have been other studies which focus on the biomechanics of load carrying and pulmonary
103 physiology (Bastien 2005). Detailed studies on medical problems faced by the porters are
104 limited. One study done in the Annapurna region highlights medical problems in both Nepali and
105 foreign nationals in the route. They report fewer medical problems in the Nepali nationals

106 (porters and staff) compared to foreign tourists (Drew 2011). However, they also mention that
107 this might reflect lower reporting of perceived problems in the porters as compared to trekkers.
108 In the following section, we attempt to shed light on some illnesses encountered by porters in
109 Nepal.

110 High altitude illnesses

111 Contrary to popular belief, all porters are not high-altitude dwellers. In fact, a large proportion of
112 them live in low altitudes and only go to high altitude areas for work (Malville 2001, Koirala
113 2018, Newcomb 2011). Thus, they are predisposed to AMS on rapid ascent which they
114 commonly do for financial gain. This is contrary to the local Sherpa porters who are known to be
115 genetically better adapted to high altitude (Droma 2008). Studies looking at medical illnesses in
116 porters and trekkers in the Manaslu region of Nepal, 8-12% of porters suffered from AMS
117 (Basnyat 1997, Hillenbrand 2006). Another study done in the Khumbu reports a much higher
118 (37%) rate of AMS in non-Sherpa porters at 4400m (Basnyat 2001a). Although studies about
119 incidence of HAPE and HACE in porters are lacking, there are numerous case reports that
120 highlight that these problems do indeed occur in porters. But, because of late reporting of
121 symptoms, the sick porters usually present in extremis (Baniya 2017, Fagenholz 2007, Basnyat
122 1999). The Sherpa porters have now generally been replaced by other lowland ethnic groups like
123 Rais, Limbus, Chhetris and Bahuns etc who are probably more predisposed to suffer from
124 altitude-related problems. These porters are therefore at the same risk of altitude illness as a
125 trekker would be (Basnyat 2001a). Lack of knowledge about the symptoms, prevention and
126 reluctance to report any symptoms may account for the rate of altitude illness among porters
127 (Newcombe 2011). In addition, mitral stenosis following rheumatic heart disease which is
128 common in Nepal (Shrestha 1991, Shrestha 2012) may be asymptomatic at lower altitude but due

129 to pulmonary hypertension of high altitude, porters may present with pulmonary edema and may
130 be misdiagnosed as HAPE (Hultgren 1992).

131 The fact that porters may also be equally at risk of altitude illness is very important for trekking
132 groups, companies and tourists to recognize because there is often a false preconception that
133 porters working at high altitude all hail from high altitude and are hence relatively immune to
134 high altitude illness. It is paramount to realize that this is not the case and attention has to be
135 given to the porters travelling with the expedition.

136 Diarrhea

137 Acute diarrhea is by far the commonest illness occurring in travelers to Nepal (Pandey 2010).

138 The risk factors of poor hygiene, lack of water in high altitude locations, eating habits and not
139 treating drinking water are at work not just for travelers but also for the porters. The local
140 population also suffers from diarrheal diseases (Pokharel 2004). All studies that have looked at
141 medical problems in porters, have mentioned gastroenteritis and diarrhea occur commonly.

142 However, the rates of diarrhea in porters was reported to be less than the trekkers travelling with
143 them (Basnyat 1997, Drew 2011). Diarrheal illnesses can be very incapacitating for the porters
144 and they may continue to carry heavy loads despite being dehydrated as they may not complain
145 due to the fear of losing their job. In addition, because it is spread by fecal oral transmission,
146 diarrhea may spread rapidly to other individuals in the traveling party.

147 Other Infections:

148 Although high altitude trekking and climbing is an important attraction for tourists to Nepal, it is
149 relevant to note that Nepal lies in the subtropical climate zone and various infections (like
150 diarrhea as discussed above) are common in Nepal including vector borne diseases (Pokharel,

151 2004, Basnyat 2001b, Murdoch 2004). The porters as part of the local population share the same
152 burden of infections, when they are at home and when they work. Apart from the very common
153 gastrointestinal and respiratory infections, others such as enteric fever, dengue, typhus, viral
154 hepatitis, influenza are also frequently encountered in those traveling to high altitudes (Basnyat
155 2001b, Amatya 2020). Finally, tuberculosis is a major public health problem in Nepal, with
156 44000 new cases reported in a year throughout the country, and nearly 10,000 cases still
157 undiagnosed or unreported (National Tuberculosis Program Nepal Annual report 2073/74
158 (2017)). Cough in a porter may be due to tuberculosis and not the ubiquitous Khumbu cough.

159 Trauma/ Musculoskeletal injuries:

160 Wearing improper footwear and non-ergonomic load carrying can make trauma and
161 musculoskeletal problems more frequent among porters. Carrying excess weight can lead to back
162 problems and potentially makes the porters more prone to falls, resulting in injuries (Malville
163 2001). However, studies in the past have not shown increased orthopedic injuries in porters
164 despite the heavy weights they carry (Basnyat 1997). A physiological study on commercial
165 porters in Eastern Nepal concluded that they can carry extremely heavy loads without persistent
166 medical problems because of their unique technique of self-paced, intermittent exercise (Malville
167 2001, Basnyat 2001c).

168 There has been a limit put on loads that porters are allowed to carry. However, monitoring is still
169 difficult and often missing. Porters are usually paid according to the amount of load they carry
170 and therefore there is always a motivation to carry more. The increased physical exertion can
171 easily predispose the porter from the lowland to increased risk of altitude related illnesses.

172 Frostbite/ Cold injuries:

173 Although there is no formal data on the number of cases of frostbite among porters at high
174 altitude, an assumption can be made that the rate is as high as in trekkers and climbers with
175 almost 40-50 cases in a year in Nepal (SD Personal experience). A study done in neighboring
176 Pakistan suggests high rates and poor prognosis of frostbite in porters. Improper gear, poverty,
177 lack of knowledge on prevention or management, use of alcohol and colder accommodation are
178 likely factors. (Hashmi 1998). The same factors apply in Nepal. The lowland porters are
179 specially at risk as they may not be used to the cold, hypoxic environment, have improper gear
180 (sandals and flipflops for footwear/ cotton or wool gloves) and are unaware of the symptoms and
181 what to do in case of cold injuries. Hence frostbite cases in the local population which have been
182 improperly managed by the patient or their friends are commonly seen. Frostbite can have
183 devastating effects for porters. Proper medical treatment for frostbite is difficult to find in Nepal
184 and when available may be expensive. Even when medical treatment is available most times the
185 porters arrive late to the medical facilities and hence might not be candidates for thrombolysis or
186 prostaglandin analogues (WMS Frostbite 2019). Those that do arrive in time may be unable to
187 get treatment because of the high costs involved. Any loss of tissues for the porters can rob them
188 of their income whether it is carrying loads or working in the fields. It is important to make sure
189 that the porters have weather appropriate gear and knowledge about frostbite symptoms and first
190 aid.

191 Other diseases: Uncorrected refractory errors, photokeratitis are more common in porters owing
192 to lack of proper protective gear as well as reluctance to seek health advice (Gnyawali 2017,
193 Basnyat 1997, Drew 2011). Gastritis, commonly known among locals as the “national disease of
194 Nepal” is also well reported (Drew 2011).

195 With poor health seeking behavior being the norm among people from rural Nepal, other chronic
196 and non-communicable diseases can also be expected to factor in the health of the porters, who
197 are usually from poor socio-economic strata. Children working as porters experience a
198 substantially increased risk of negative physical, emotional and educational outcomes due to
199 their involvement in exploitive and dangerous work. Working as porters prevents access of
200 children to education and in turn better employment, continuing the cycle of poverty in the long
201 run (Doocy 2007).

202 Mental Health: Common mental disorders have been shown to be associated with poor socio-
203 economic condition (Patel 2003). Working under stress away from their families in an inherently
204 dangerous environment the porters might have some psychological issues. With mental illness
205 still considered a taboo in Nepali society, manifestations of this at high altitude can be potentially
206 problematic and often go unreported.

207 A study by Bauer et al, about the health of the Inca Trail Porters in Peru also highlights similar
208 problems (back pain, fever, respiratory problems, stomach pain), with less altitude illnesses
209 (Bauer 2003). Unlike the Inca trail porters who suffered from lack of clothing and equipment, the
210 availability of cheap Chinese clothes and shoes has offset that problem to some degree in Nepal.

211 Organizations like Himalayan rescue Association (HRA, by providing free and/or inexpensive
212 health care to porters in Khumbu and Manang) and International Porter's Protection group
213 (IPPG; porters' shelters, health care, education) are working tirelessly to help improve the
214 conditions of the Himalayan porters. The recent closure of the IPPG aid posts in the Gokyo
215 Valley seems a backward step in porters' health. The aid posts catered to equal proportions of
216 tourists and porters, and the porters got free treatment. The closure has the potential to leave

217 many porters' as well as locals without access to healthcare. This event has also brought into
218 attention that ulterior motives may be at play undermining good work by these organizations.

219 However, it is clear that more needs to be done by the trekking companies and the government to
220 enforce responsible trekking (Kupper and others 2012), ensuring proper treatment, compensation
221 and health care for the backbone of the Nepalese tourism industry.

222 What can be done: Table 1

223

224 Conclusion: There is still a large void that needs to be filled when it comes to knowledge about
225 medical problems in porters. Simple checklist documentation (for example frostbite incidence) of
226 porter health problems by the existing high-altitude check-posts would be very helpful to figure
227 out the extent of the problem. Basic requisites of education and better socio-economic status
228 need to improve for better health status. Trekking agencies and groups need to understand and
229 practice responsible trekking. Educating trekkers in porters' care and making them put pressure
230 on trekking companies to guarantee porter care could be one way going forward. The UIAA
231 recommendations on how to choose trekking companies can help trekkers make responsible
232 decisions (Hillebrandt 2012). It is important to make sure health and evacuation insurance are in
233 place for the porters and to provide regular first aid training. Pre-travel assessment of health
234 status and optimization in case of chronic diseases might need to be prioritized. Porters are the
235 cornerstone of any expedition and deserve to be cared for by their employer. It is the
236 responsibility of the trekker or mountaineers to ensure this happens

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