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# Implications of changing trekker demographics on travel health in the Annapurna region

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## ABSTRACT

**Objective:** The objective is to investigate trekkers' changing demographics, travel patterns and experience of illness in the Annapurna region.

**Study design:** A mixed method study comprising a cross-sectional survey was carried out with trekkers who had completed trekking in the Annapurna region.

**Methods:** Interviews were carried out with trekkers using a standardised questionnaire from September to December (main trekking season) 2014 and 2016. The interview format included trekkers' demographic characteristics, travel patterns, preparation and logistics and experiences of illness and treatment.

**Results:** The demographic composition of trekkers had changed. Chinese and Nepalese trekkers were the most dominant groups along with other international trekkers from 16 different countries. In terms of the trekking pattern, the Chinese and the Nepalese trekkers spent a median of 7 days each in the trek and trekked to a median altitude of 3500 m, while other international trekkers spent a median of 10 days and trekked to a median altitude of 4000 m. In general, trekkers' food habits and travel patterns were good. They undertook some health preparation by using the Internet, consulting friends and travel guidebooks and consulting a doctor, pharmacist and other healthcare providers and brought medicines accordingly. However, 25% of trekkers, most commonly Chinese, Korean and Nepalese, came without any health preparation and with no medicines. Thirty percent of the trekkers became sick during the trek with common illnesses such as diarrhoea, vomiting, the common cold, headache, fever and altitude-related symptoms.

**Conclusions:** Trekkers' demographic composition has changed from that found in previous studies, and this was reflected in their trekking pattern. Trekkers' health preparations for high-altitude trekking were still inadequate, especially among the newer groups such as the Nepalese, Chinese and Korean trekkers. Issues such as trekkers' health preparation and practice, eating patterns, the length of trek and altitude and health and safety provision need further improvement, especially in the context of these changing trekker demographics.

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## Introduction

Each year, thousands of tourists from all over the world travel to high-altitude trekking destinations such as the Himalayas, the Andes and the Alps.<sup>1</sup> Owing to the fragile environment, rugged terrain, harsh weather conditions and the different physiological and metabolic responses of the human body at high altitude, health and safety remain as key concerns for trekkers.<sup>1</sup> From a travel health perspective, it is advisable for a traveller to have a medical checkup, get information about health risks and take prophylactic measures according to the requirements for their travel destination.<sup>2</sup> Previous studies from Nepal have reported several problems experienced by high-altitude trekkers such as travellers' diarrhoea, acute mountain sickness, muscle aches/sprain/strain, injuries, respiratory illness, skin disorders, febrile syndromes and also fatalities.<sup>3–9</sup> Furthermore, studies have also reported on trekkers with chronic health problems, those trekking with children and elderly trekkers in Nepal; therefore, it is important to explore high-altitude trekker's pretravel healthcare seeking.<sup>7,10,11</sup>

The current general practice and studies recommend that travellers to high altitude need to know about the physiological effect of altitude, standard ascent pattern and symptoms and management of altitude illness.<sup>1,12</sup> Similarly, for travellers with pre-existing health conditions, recommendations include training for physical demand, proper use of prophylactic medication and proper assessment of the interaction of the medicines they are currently using with the ones they use for travel.<sup>12–15</sup> However, studies with high-altitude trekkers in Nepal have focussed mostly on the incidence and complication of altitude illness and other health problems at high altitude, and there is a lack of literature around high-altitude trekkers' health preparation, experiences and travel pattern in Nepal.<sup>4,6,13,16,17</sup>

The Annapurna region, located in the Western Himalayas, is the study setting.<sup>18</sup> It is an area comprising high hills and mountains spread more than 7629 sq. km., covering 57 villages spread across five districts.<sup>18</sup> The region is one of the world's most popular trekking destinations and is home to the famous Annapurna mountain range that includes the Mt Annapurna I (8091 m) and Mt Dhaulagiri (8167 m).<sup>19</sup> It is popular for long and short treks and ecotourism.<sup>19,20</sup> The peak trekking season is spring (March–May) and autumn/fall (October–November).<sup>21</sup>

Exploring high-altitude trekkers' health in the Annapurna trekking region is of global relevance for several reasons. It receives more than 100,000 trekkers each year (108,306 in the year 2016 alone).<sup>22</sup> With the advent of Nepalese and other Asian trekkers, the demographic composition of high-altitude trekkers is changing.<sup>16,17,23</sup> New roads have been built along the trekking route in some areas that can affect the standard ascent time and also make high-altitude destinations more accessible. Trekkers continue to experience various healthcare problems, and health care for trekkers outside the capital Kathmandu is more limited.<sup>16,17,23,24</sup> Thus, this study aims to investigate the current demographic and travel patterns, health preparation and experience of illness of trekkers with a case study of the Annapurna region of Nepal.

## Methods

This study undertook a mixed methods approach comprising quantitative and qualitative components. The interview format contained structured questions and open-ended questions to extract more information from the trekkers.

### Development of the interview protocol

An interview format was developed after a detailed literature review. The interview format included information on the following: (a) demographic characteristics; (b) travel patterns, preparation and logistics; and (c) illness experiences and healthcare seeking behaviour in the Annapurna region (see [Appendix 1](#) for questionnaire).

### Ethical approval

Ethical approval for this research project was granted by the University of Otago Human Ethics Committee, Dunedin, New Zealand (14.10.2013) and by the Nepal Health Research, Nepal (01.01.2014). Institutional permission was also obtained from the Himalayan Rescue Association Nepal and Annapurna Conservation Area Project (ACAP).

### Data collection

#### Sampling

Trekkers were identified based on a convenience sampling method and were invited to participate in the study. Trekkers who fulfilled the inclusion criteria and agreed to participate in the study were recruited. All 105 invited trekkers agreed to be interviewed.

Inclusion criteria:

- Both Nepalese and international trekkers who have recently completed trekking in the Annapurna region for any number of days and any part of the Annapurna region;
- Trekkers who can converse in English or Nepali language.

Exclusion criteria:

- Porters and guides;
- Trekkers who cannot converse in English or Nepali language.

#### Approach

Tourism industry networks such as travel agencies and hotels/lodges were consulted for advice on how to access trekkers who had completed trekking in the Annapurna region.

Data collection was carried out from September to December 2014 and September to December 2016 with trekkers who fulfilled the inclusion criteria.

The trekkers were briefed about the research objectives and content of the study. Most of the trekkers expressed their views on the questions frankly and clearly. Interviews with the international trekkers were carried out in English, and for those trekkers whose English was not fluent, the interview

process was carried out slowly, allowing sufficient time for the trekkers to think and respond to each question.

Interviews with the Nepalese trekkers were carried out in the Nepali language and recorded (written down) by two research assistants in both Nepali and English languages. The final version of the interview transcript was prepared in English and was reviewed by the researcher (first author) and the research assistant to ensure that the essence of the interview was captured.

### Data analysis

The quantitative information was analysed by using SPSS software, version 20.

The qualitative information was first sorted into Excel sheets. A list of the main themes from the interview was created with each response read carefully to determine if they could be grouped into subcategories. Each comment was then coded and linked to the category. After the comments under each category were added, the information was then summarised and analysed using simple descriptive statistics.

## Results

### Trekkers' demographics

A total of 105 trekkers from 16 different countries (including Nepal) who had completed a recent trek in the Annapurna region were interviewed. Most were from Nepal (22%), China (21%) and other countries such as Korea (12%), France (10%) and the US (9%), followed by Australia, the UK, Spain, Japan, Germany, Israel, Peru, Switzerland, Brazil, Bolivia and Canada.

The average age of the trekkers was 37 years; the median age was 35 years with an interquartile range (IQR) of 13 (23 years–70 years). Seventy percent of the trekkers were men and 30% were women.

### Length of trek

Trekkers completed their trek in a median of 8 days (IQR = 3 days). They trekked to various points in the Annapurna region situated at an altitude range of 3000 m–5000 m and above. There was a statistically significant difference in the median days spent and median altitude covered by the three categories of trekkers (Chinese, Nepalese and other international trekkers) at  $P < 0.001$ . In comparison to other international trekkers (median = 10 days, IQR = 4.5 days), the Chinese trekkers (median = 7 days, IQR = 1 days) and Nepalese trekkers (median = 7 days, IQR = 2 days) spent fewer days on the trek. Correspondingly, other international trekkers trekked to a median altitude of 4000 m (IQR = 775 m), Chinese trekkers trekked to a median altitude of 3500 m (IQR = 0 m) and Nepalese trekkers trekked to a median altitude of 3500 m (IQR = 500 m).

### Travel pattern

The majority of the trekkers stayed in lodges, hotels and other types of accommodation that are set up in small tourist towns along the trekking trails to provide accommodation and

restaurant services to the trekkers. Regarding food preferences, dal bhat (a Nepali cuisine comprising rice, vegetables and lentils) was the most commonly eaten food, followed by soup and other food items as shown in Table 1. Some trekkers avoided salad and some other food items. During the trek, people most commonly used distilled bottled water and water treated by other means such as boiling or iodine.

As shown in Table 1, some 63% of the trekkers trekked in a group without a guide, 30% trekked in a group with a guide and 7% trekked alone.

### Health preparation and experience of illness

As shown in Table 2, most of the trekkers were first-time visitors to Nepal. The majority (75%) of the trekkers carried out some health preparation for the trek such as visiting a doctor, visiting a pharmacy, Internet searching and asking friends and brought medicines accordingly. However, as shown in Table 2, a significant number of trekkers came to trek without any healthcare preparation and medicines. This was common for Chinese and Nepalese trekkers. The majority (78%) of trekkers could identify common health risks associated with trekking in the Annapurna region including altitude illness, while the rest could not. Also, the majority of the

**Table 1 – Travel patterns.**

Travel patterns	Number	Percent
Accommodation during the trek	(N = 105)	
Lodge	49	47%
Hotel	50	48%
Tea house	2	2%
Guest house	4	3%
Type of food during the trek	(N = 201 food responses)	
Chocolate	4	
Curry	2	
Dal bhat/fried rice	79	
Momo (dumpling)	10	
Noodles	38	
Pasta	34	
Soup	23	
Spaghetti	7	
Vegetables	2	
Pancake	7	
Particular food avoided	(N = 105)	
Not avoided any food	74	70%
Avoided food	31	30%
Common food items avoided	(N = 31)	
Salads	22	
Uncooked foods	6	
Noodles	3	
Preferred drinking water	(N = 105)	
Bottled water + water treated with iodine + boiled water	88	84%
Boiled water + tap water	17	16%
Source of water	(N = 105)	
Bought locally	77	73%
Other sources	28	27%
Nature of trek	(N = 105)	
Trekking in group (with guide)	32	30%
Trekking in group (without guide)	66	63%
Trekking alone	7	7%

**Table 2 – Health preparation before the trek.**

	Number (N = 105)	Percentage
Previous visit to Nepal		
No	75	72%
NA (Nepali trekkers)	22	21%
Yes	7	7%
Health preparation before travel (N = 105)		
No medicines/no healthcare preparation (13 Chinese trekkers, 8 Nepalese and 5 trekkers from other countries)	26	25%
Did some healthcare preparation for the trek	79	75%
Visited doctor and brought medicines	13	12%
Visited pharmacy and brought medicines	14	13%
Did Internet search, enquired with friends and brought medicines	52	50%
Do you know about health risk in the Annapurna region? (N = 105)		
Yes (yes I know about health risks in the Annapurna region such as [1] altitude/mountain sickness, [2] fatigue/muscle wasting, [3] muscle sprain/strain/injury/fall, [4] respiratory problem/cold/flu, [5] dehydration, [6] sun/heat stroke, [7] fever/headache, [8] GI problem/diarrhoea, [9] problems in eyes due to bright light and [10] allergy)	82	78%
No* (do not have much idea about health risk in the Annapurna region) (3 Chinese, 1 Swiss, 1 Bolivian, 1 Spanish trekker)	7	7%
Yes but did not mention altitude illness (6 Chinese trekkers and 10 Nepalese trekkers)	16	15%
Do you know about healthcare facilities in the Annapurna region? (N = 105)		
No (do not have any idea)	90	86%
There might be some basic healthcare facilities there but health service might be poor (1 German, 1 US and 1 Korean tourists and 12 Nepalese trekkers)	15	14%

GI, gastrointestinal; NA, not applicable.

trekkers did not have any idea about the availability of healthcare facilities and services in the Annapurna region.

Regarding health preparation, a significant number (90%) of the trekkers had not received any vaccinations before travel, while the rest received a range of vaccinations, such as for hepatitis A, typhoid, tetanus and influenza. Similarly, the majority of the trekkers said that they did not bring any first aid kit for the trek.

Seventy percent of the trekkers did not get sick during the trek, whereas 30% (31) did. Of the 31 tourists who were sick, most were Chinese (9), Korean (5) and French (4) tourists followed by other tourists in smaller numbers. Among those who were sick, diarrhoea (9) was the most common, followed by diarrhoea and fever (5), symptoms of altitude sickness (5), the common cold (4), the common cold and fever (3), headache (2), fever (2) and vomiting (1).

### Medicines brought/used for trekking purposes

Trekkers brought different medicines (N = 632 total medicines) among which antibiotics, analgesics, anticold combination medicines, medicines for altitude sickness, oral rehydration salts (ORS) and antidiarrhoeal medicines were the most common ones. In addition, trekkers also brought medicines such as cough syrup, potassium supplement, herbal medicines, first aid agents and antiemetic medicines.

Seven percent (44 of 632 total medicines) of the medicines brought by trekkers were for altitude sickness. These included acetazolamide (30), amlodipine (5), dexamethasone (2) and sildenafil (7). Acetazolamide (5 of 30) was used by trekkers for preventive purposes.

As shown in Table 3, the 30% of the trekkers who were sick during the trek used medicines (number out of 632) such as antibiotics, analgesics, combined analgesics and anticold

medicines, antidiarrhoeal, altitude sickness medicines and medicines for vomiting. Although 9% (57 of 632) of the medicines brought for trek were ORS, none of the trekkers who had diarrhoea (14 trekkers) used the ORS.

### Disposal of medicines brought for trekking

Forty-three percent of the trekkers planned to take the medicines back with them, 21% wanted to donate them to some non-government organisations in Pokhara or Kathmandu, 16% wanted to give them to the porters' group (non-profit local organisation working for the welfare and support of porters), 11% were undecided and 9% of them did not have any medicines.

## Discussion

Although trekkers in the Annapurna region come from many different countries, including Nepal, the demographic composition of trekkers has changed. There are now a large proportion of Asian trekkers (Chinese and Korean) among international trekkers, which formerly mostly comprised North and South American and European trekkers.<sup>23</sup> This changing demographic composition was also reflected in the trekking pattern. Chinese and Nepalese trekkers spent fewer days on their trek and did not trek to such high altitudes as trekkers from other countries, as they had limited vacation days.

Acute Mountain Sickness (AMS) is the most pressing travel health implication of the changing demographic pattern. Although a study more than 24 years in Nepal found a declining prevalence of AMS in trekkers in the Himalayas owing to slower ascent and use of acetazolamide, the authors argue that AMS is still an issue.<sup>25</sup> Furthermore, the short acclimatisation and resting times spent by the Chinese and the Nepalese

**Table 3 – Trekkers' healthcare problems during the trek.<sup>a</sup>**

Diseases	Number of cases	Medicine taken	Category
Diarrhoea	9	Ciprofloxacin 250 mg Loperamide 2 mg	Antibiotics Antimotility drug
Diarrhoea and fever	5	Loperamide 2 mg Paracetamol 500 mg Ciprofloxacin 250 mg	Antimotility drug Analgesic/antipyretic Antibiotics
Common cold	4	Paracetamol + pseudoephedrine tablet Paracetamol 500 mg Amoxicillin 500 mg	Analgesic + nasal decongestant Antibiotics
Common cold and fever	3	Paracetamol + pseudoephedrine tablet Paracetamol 500 mg	Analgesic + nasal decongestant
Fever	2	Paracetamol 500 mg and paracetamol 1000 mg	Analgesic + nasal decongestant
Headache	2	Paracetamol + pseudoephedrine tablet Paracetamol 500 mg	Analgesic + nasal decongestant
Altitude illness (preventive use)	5	Diamox 250 mg OD 1 day before the trek and throughout the trek	Diuretic (carbonic anhydrase inhibitor)
Vomiting	1	No meds (resolved)	

<sup>a</sup> A total of 31 of 105 tourists got sick during the trek.

trekkers and the incidence of altitude illness symptoms and headache in our study indicate that AMS is still a significant travel health risk for trekkers in the Himalayas. Our study also shows that around a quarter of trekkers did not bring altitude illness medicines with them, despite all trekking at an altitude range of 3000 m and above. Trekkers need to have consulted healthcare professionals and bring appropriate medicines for high-altitude trekking. Furthermore, using an experienced travel guide with knowledge of mountain sickness is vital for high-altitude trekking because the guide can recognise early signs and symptoms of altitude illness in their clients and help them. Guides can also help trekkers in case of harsh weather condition and other mishaps.<sup>6,26</sup>

Regarding food items, most of the trekkers said that they did not avoid any food item that goes against the recommendations of organisation such as the Centers for Disease Control and Prevention (USA) and travel guidebooks such as the Lonely Planet.<sup>27</sup> Trekkers need to be cautious about the kind of food they eat during the trek, especially uncooked food and tap water because diarrhoea is one of the most common illnesses for travellers in Nepal.<sup>28,29</sup> Most (83%) of the trekkers preferred bottled water, but they also used boiled water and water treated with iodine, which again was common health advice for travellers to Nepal.<sup>27</sup> However, 16% of trekkers, mostly Nepalese, also used tap water for drinking, further indicating the different habits of the Nepalese trekkers. High-altitude trekkers need to stick to a healthy diet and eating habits recommended by healthcare agencies to stay fit and healthy during the trek.

Trekkers most commonly relied on the Internet and consulted friends and guidebooks for health preparation for high-altitude trekking, as also found in the study by Havryliuk et al.<sup>16</sup> People extract and use information from the Internet in different ways, and therefore, relying on the Internet could leave some trekkers relatively unprepared, while others would be well prepared. However, it is concerning that 25% of the trekkers had not perform any health preparation for high-altitude trekking in the Annapurna region and lacked medicines for altitude illness and other health problems. Trekkers need to have good information about the common health

problems during high-altitude trekking so that they can take the right medicines and know how to use them correctly. Where possible, trekkers should consult a doctor or pharmacist about proper health preparation for high-altitude trekking.

Thirty percent of the trekkers in our study were sick during their visit. This incidence of illness is higher than an earlier study by Basnyat and Litch with commercial trekking groups that had reported medical problems with 17% of Western trekkers.<sup>5</sup> As previously mentioned, diarrhoea was the most common health problem followed by symptoms of altitude sickness, fever, headache, the common cold and other illness. Previous studies have also reported these symptoms, mainly diarrhoea and symptoms of altitude illness.<sup>5,6,29</sup> However, none of the trekkers who reported having diarrhoea said they used ORS, using antibiotics and antimotility agents instead, which are recommended by overseas travel health guidelines.<sup>30</sup> Other studies have also reported high-altitude pharyngitis/bronchitis, gastroenteritis and other conditions including anxiety, cellulitis, scabies, snow blindness, acute alcohol intoxication, conjunctivitis, fever, lacerations and haemorrhoids.<sup>4,5</sup>

Travellers' health at high altitude has been widely researched worldwide, including the Himalayas. This study, however, adds to the wider body of travel health literature in terms of health preparation and the use of medicines by high-altitude trekkers and the changing demographics of high-altitude trekkers in Nepal. Such information will be useful to the international trekking community and travel health practitioners. The findings of this study about high-altitude trekkers' health experience and logistics need should also be helpful for tourism stakeholders in developing policies and plans for high-altitude trekkers' health and safety in the Himalayas of Nepal and India.

### Limitations

The principal limitation of this study is the relatively small sample interviewed. The Annapurna region receives more than 100,000 trekkers each year. Owing to the feasibility and resources limitation, only 105 trekkers were interviewed

based on convenience sampling. These 105 trekkers do not represent the entire trekkers' population in the Annapurna region. Despite some interesting findings of trekkers changing demography in the Annapurna region, the findings of this study cannot be generalised to the entire population. Furthermore, for practical reasons, trekkers who could not communicate in English or Nepali were excluded; inclusion of these trekkers with an interpreter could have added more information and value to the study.

### Conclusions

Overall, trekkers' health preparation for travel at high altitude was still inadequate, despite the ongoing popularity of trekking at an altitude range of 3000 m and above. The changed demographics of high-altitude trekkers, especially the advent of the Chinese and the Nepalese trekkers, and their travel patterns need further consideration. Issues surrounding trekkers' food habits, the number of days of trek and the use of various resources for health preparation were of concern. Trekkers brought and used various medicines and consulted the Internet, friends and guidebooks. However, consulting a pharmacist, a doctor or another healthcare worker, wherever possible, for health preparation is recommended; this also helps reduce overall travel-related morbidity. By and large, there is a need to improve health preparation, health and safety provisions and logistical services for trekkers in the Nepalese Himalayas; doing so will also provide health benefits to the local population.

### Author statements

#### Ethical approval

Ethical approval for carrying out this study was obtained from the University of Otago Human Ethics Committee (reference number 13/239) and Nepal Health Research Council (reference number 189/2013).

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#### Competing interests

The main author Bhuvan KC received PhD Scholarship from the School of Pharmacy, University of Otago. The other authors declare no conflict of interest.

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## Appendix 1. Structured interview format with trekkers and trekking

- Part I: Demographic and travel patterns and experience of illness of tourists in the Annapurna region  
 Part II: Interactions of tourists with local people on health-related matters

### Part I

#### Demographics

Date:

Nationality:

Age:

Length of time in Nepal before this trek:

Nature of trek

Are you travelling alone or in a group?

What is the purpose of your trek?

Number of days of trek?

Travel patterns

1. Where did you stay during the trek? (accommodation during travel)

2. What kind of food did you eat during the trek? (Probing to get information on whether they are local food, hotel food, self-cooked or other)

3. Did you avoid any particular food due to health concern during the trek? (probing to know the name of the food and reason to avoid it)

4. Which type of drinking water did you use or prefer to use? (Probe to know whether mineral water, local tap water, boiled water, etc.)

a) Source of water

b) How is the water treated?

Health preparation and experience of illness during travel

1. Have you been to Nepal before? If yes, where, for how long and reason for visit?

2. Have you made any kind of health/medical preparation before travel? (Probe about the kind of health preparation like consulting a doctor, travel medicine clinic, visiting the local pharmacy, researching on the internet, self-preparation, consulting a friend etc.)

3a. What did you know about the health risks in the Annapurna region before trekking? (Probe about awareness of possible health risks in high altitude like acute mountain sickness, headache, respiratory problem, sprain, fatigue, accident injury, GI problems etc.)

3b. What did you know about the availability of health services in the Annapurna region?

3c. What did you plan to do if you got sick?

4. Did you get any vaccine/immunisation as part of pre-travel consultation? (Probe to know the name and type of vaccination if the answer is yes and from whom e.g. doctor, paramedics, clinics etc.)

5. Have you brought any kind of first aid kit for travel purpose?

(If yes, please name the contents in the first aid kit)

6. If medicines have been bought? (probe further to know)

Where was it bought?

How was it bought (e.g. directly from a pharmacy/drug store, online or other)?

What medicines were bought?

7. Did you get ill/sick during the trek?

If yes what kind of illness was it? (and go to 8)

8. How did you treat the illness during the trek? (Include all the healthcare seeking activity done by the trekker including self-care.

Also ask if they had to change their plans. If they were with a group – were they able to continue the trek as scheduled?)

### Part II

#### Interaction with local people on health/medicines issue

1a. Did you interact with the local people on any health related issues? (Probe to know whether the trekker and the local people interacted about health issues during the stay. It can be interaction with any local person or any kind of health system)

1b. Were you asked for any medicines? If so, what and what for? How did you respond?

2. If you stayed with a local family (home stay) during the trek – Were you aware of any local health issue or health problems in the family? Were you asked for any medicines? If so, what and what for? How did you respond?

#### Treatment/disposal of medicine

1. What are you planning do with the medicines you brought for the trek? (Please explain)