

High Altitude Illness among Rapidly Ascending Pilgrims to Kailash Mansarovar

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ABSTRACT

Background: High altitude pilgrims typically ascend rapidly, are not well prepared for the austere environment and tend to have multiple co-morbidities. Here, we list the trend of altitude and other illnesses who visited Humla district hospital (2,950 meters) following very rapid ascent to Kailash Mansarovar (4,500 meters).

Methods: A prospective study was conducted among 55 patients at the Humla District Hospital from September 2019 – August 2022. Patients who fell ill during pilgrimage and brought to the hospital were included. The patients were assessed with medical history and clinical examination. Lake Louise Score Acute Mountain Sickness Score (2018) was used for the diagnosis of Acute Mountain Sickness.

Results: A total of 56 evacuees visited the hospital which included 55 patients and 1 brought dead. The mean age was 50.63 ± 10.91 years. Sixteen patients (29.1%) developed symptoms within 24 hours and 15 patients (27.3%) within 48 hours of ascent. Headache 42 (76.4%) was the most common complain. Mild acute mountain sickness (30.9%; 17 patients) was the most common altitude related illness while 14 patients (25.4%) were diagnosed with non-altitude related illnesses. Twelve patients (21.8%) had co-morbidities like hypertension and diabetes mellitus.

Conclusions: In the rapidly ascending pilgrims, majority of travelers requiring medical attention are suffering from some form of altitude illnesses. Hence, proper planning and public awareness about slow and gradual ascent profile is necessary to make the travel safer.

Keywords: High altitude illnesses; high altitude pilgrimage; kailash mansarovar; rapid ascent.

INTRODUCTION

High altitude pilgrimage is a very common practice among the Hindu and Buddhist population in south East Asia with hundreds of thousands of pilgrims travelling to high altitude destinations since ages.¹ Pilgrims try to visit as many destinations as possible late in their life to gain spiritual fulfillment and a path to salvation. Since last decade, mode of travel has changed from trekking to use of modern day transportation like motor vehicles and helicopters which literally takes no time to reach high altitude destinations.² Moreover, this group of people primarily are elderly with co-morbidities^{3, 4} and are not familiar with the environmental and health hazards of high altitude.

Kailash Mansarovar (4500 meters), one of many high altitude destinations welcomes >40,000 pilgrims annually.¹ With the availability of transportation facilities, almost all of the pilgrims reach the destination in <72 hours. Majority of ill travelers are brought to Humla Hospital with altitude illnesses and complications of pre-existing diseases. The aim of the study was to study the epidemiological profile of altitude sickness and other illnesses among the patients visiting the hospital after rapid ascent to Kailash Mansarovar.

METHODS

This study was a cross sectional study conducted at the Humla Hospital, Nepal after acquiring the ethical

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approval from the Nepal Health Research Council. This study was conducted over a period of a year from September 2019 to August 2020. Informed written consent was taken from the participant and the proforma was completed by the treating clinician. Travelers with ascent rate of 300-500 meters sleeping altitude per day with a rest day after 800-1000 meters ascent were classified as normal ascend profile while anything faster and without rest days were classified as rapid ascent. All the lowlander patients rescued from the Kailash Mansarovar pilgrimage and brought to the hospital with any clinical complaints were considered for the study and adult patients (>16 years) providing the informed consent were enrolled in the study. Exclusion criteria included children and pilgrims permanently residing at high altitude (>2500 meters). A total of 56 patients visited the hospital during the study. One patient was brought dead (later declared at the hospital) and was excluded in the data analysis.

Detailed history was taken, physical examination was performed and needful laboratory investigations were done for the diagnosis. Acute mountain sickness (AMS) was diagnosed using Lake Louise Acute Mountain Sickness Score (2018). Score of 3-5, 6-9 and 10-12 were classified as mild AMS, moderate AMS and severe AMS respectively. High altitude pulmonary edema (HAPE), high altitude cerebral edema (HACE) were diagnosed clinically and with the supporting evidence of chest x-ray. Electrocardiography was performed in patients with chest pain for the screening of acute coronary syndrome.

Data were entered in the Microsoft excel 2010 and statistical analysis were performed using SPSS v 25.0. Standard descriptive statistics was used to describe the data. Continuous variables are expressed as mean \pm SD and categorical variables were expressed as number and percentage.

RESULTS

The mean age of the patients was 50.63 ± 10.91 years. Majority of the patients were male with sex ratio of Male/Female: 3:2 and 54 patients (98.18%) were Indian Hindus (Table 1).

The mean altitude of residence of the patients was 359.3 ± 395.77 meters. The median and mode altitude of residence was 300 meters above sea level. Patients residing as low as 6.7 meters and as high as 2276 meters from sea level were on the pilgrimage.

Table 1. General Characteristics of studied patients. (N=55)

SN	Variables	Frequency
1	Mean Age (years)	50.63 ± 10.91
2	Sex ratio (Male: Female)	3:2
3	Indian Nationality (%)	98.18%
	Nepali Nationality (%)	1.82%

All the patients reached the maximum of 4755 meters and returned back during the pilgrimage. The maximum number of days required to complete the pilgrimage was four days which was taken by only 13 patients (23.63%) while 42 patients (76.36%) completed in 72 hours. 32 (58.18%) reached the maximum altitude (4755 meters) within 48 hours of travel (Table 2).

Table 2. Mean sleeping altitude.

Day	Sleeping Altitude (meters)	Frequency
1	3287.27 ± 670.10	55
2	4372.24 ± 557.14	49
3	4447.74 ± 460	42
4	4199.15 ± 741.41	13

Table 3. Clinical presentation of the patients.

SN	Symptoms	Frequency (Percentage)
1	Headache	42 (76.36%)
2	Fatigue	38 (69.0%)
3	Nausea	36 (65.45%)
4	Shortness of breath	31 (56.36%)
5	Cough	14 (25.45%)
6	Dizziness	12 (21.81%)
7	Chest pain	6 (10.9%)
8	Fever	5 (9.09%)
9	Pain abdomen	5 (9.09%)
10	Loose stool	4(7.27%)
11	Sore throat	4 (7.27%)
12	Drowsiness	3 (5.45%)
13	Altered sensorium	1 (1.81%)
14	Loss of consciousness	1 (1.81%)
15	Trauma	3 (5.45%)
16	Others*	9 (16.36%)

*Others: Tingling sensation, weakness of one side of body, facial deviation, extremity swelling, abnormal body movement, inability to pass urine, wrist swelling.

Table 4. Diagnosis.

Altitude related illnesses (N=41)			Non-altitude related illnesses (N=14)		
SN	Illnesses	Frequency	SN	Illnesses	Frequency
1	High altitude headache	3 (5.5%)	1	Acute Gastroenteritis	4 (7.3%)
2	Mild Acute Mountain Sickness (AMS)	17 (30.9%)	2	Musculoskeletal injuries	4 (7.3%)
3	Moderate Acute Mountain Sickness	3 (5.5%)	3	Myocardial infarction	2 (3.6%)
4	High altitude cerebral edema (HACE)	1 (1.8%)	4	Transient ischemic attack and stroke	2 (3.6%)
5	High altitude pulmonary edema (HAPE)	1 (1.8%)	5	Seizure disorder	1 (1.8%)
6	HAPE and HACE	2 (3.6%)	6	Acute urinary retention	1 (1.8%)
7	Mild AMS with HAPE	3 (5.5%)			
8	Moderate AMS with HAPE	3 (5.5%)			
9	Mild AMS with Upper respiratory tract infection	7 (12.7%)			
10	Moderate AMS with Upper respiratory tract infection	1 (1.8%)			

All of the patients used airplane, helicopter and motor vehicle (jeep) to reach the destination. None of the pilgrims who visited the hospital trekked for the pilgrimage.

Sixteen patients (29.1%) developed symptoms at an altitude of 2900 meters, 15 patients (27.3%) at an altitude of 4590 meters and 12 patients (21.8%) developed symptoms at an altitude of 4755 meters. The onset of symptoms within 24 hours of travel was found in 24 patients (43.6%).

Headache 42 (76.4%) was the most common complain followed by fatigue 38 (69.1%) and nausea/vomiting 36 (65.5%) (Table 3).

Mild acute mountain sickness (AMS) (30.9%; 17 patients) was the most common altitude related illness followed by Mild AMS with Upper respiratory tract infection (12.7%; 7 patients). High altitude cerebral edema (HACE) and high altitude pulmonary edema (HAPE) was present in one patients each and two patients suffered from HACE with HAPE (Table 4).

Fourteen patients (25.4%) were diagnosed with non-altitude related illnesses which included acute gastroenteritis, myocardial infarction, stroke, musculoskeletal injuries, seizure disorder and acute urinary retention (Table 4).

Twelve patients (21.81%) were known cases of either diabetes mellitus, hypertension or both or with complication. All of them were under some form of medication (Table 5).

Only 10 patients (18.2%) had past history of exposure

to high altitude and only 1 patient (1.8%) was under prophylactic acetazolamide. None of the patients were using any other drugs than acetazolamide for AMS prophylaxis.

Table 5. Co-morbidities of the patients.

SN	Illnesses	Frequency
1	Hypertension	7 (12.7%)
2	Diabetes Mellitus	3 (5.5%)
3	Hypertension and Diabetes Mellitus	1 (1.8%)
4	Ischemic heart disease	1 (1.8%)

DISCUSSION

This study was designed to observe the spectrum of illnesses among the rapidly ascending high altitude pilgrims visiting the Humla district hospital for medical attention. All pilgrims started the pilgrimage from Simikot, Humla (2900 meters). Pilgrims either from Kathmandu or directly from India had to fly to Nepalgunj (150 meters) and then fly to Simikot. Pilgrims then took the pre-booked helicopter to the border of Nepal and Tibet at Hilsa (3640 meters). Once they cross the border they took a jeep to reach the Kailash Mansarovar (4,500 meters).

Our study showed that 3/4th of the patients presented with the altitude related illnesses and 1/4th of the patients presented with the non-altitude related illnesses. The spectrum of the illnesses ranged from reversible and benign high altitude headache, mild AMS, soft tissue injuries to fatal HAPE, HACE and myocardial infarction.

The average age of the patients in our study is 50.63

± 10.91 years. Study done by B Basnyat et al ⁵ in 2000 among the Nepalese pilgrims in Lake Gosaikunda (4380 meters) had younger population with mean age of 33 years and another study done in 1993 had 52% patients aged >40 years.⁶ Another study done among the pilgrims at Lake Gosaikunda ⁷ had mean age of 36.7 ± 13.2 years.

The ascent profile of all the patients was extremely rapid and without any preventive strategies. In our study more than half of the patients had reached the height of 4755 meters within 48 hours of the travel. In fact, pilgrims in other pilgrimages around the Himalayas like Badrinath, Kedarnath and Muktinath have been rapidly ascending within 24-72 hours.¹ Similar finding of rapid ascent from 2000 meters to 4300 meters in 2 days was shown by study done among pilgrims in Lake Gosaikunda.^{5, 7} This ascent profile is against the guidelines of the Wilderness Medical Society which advises to make ascent of 300-500 meters sleeping altitude per day and take rest day on 3rd to 4th Day.⁸ This trend is primarily due to the easy availability of the road and air transportation system in recent years. Prior to the availability of the transportation facilities the pilgrims had to trek to reach the destination which gave more time for acclimatization.

The result of the unsafe rapid ascent is reflected in the form of altitude illnesses in our study. Majority (74.6%) of the patients evaluated in our study site were diagnosed with one or another form of altitude illnesses. There is no other similar studies to compare this data but in general, the incidence of altitude illness ranges from 20% to 70%.⁹ Similarly, severity of altitude illnesses is primarily related to acclimatization status ^{10, 11}, rate of ascent ⁸, duration of exposure to high altitude and maximum altitude reached.¹²⁻¹⁴

Study done in similar pilgrimage site in Gosaikunda had shown that incidence of altitude illness increases with the increasing age.⁶ However, the majority of the studies support the fact that severity and incidence of altitude illness is independent of age.¹²⁻¹⁴

Though there is no statistical data to compare the spectrum of illnesses in this pilgrimage before the availability of the transportation system, we cannot deny the fact that more and more pilgrims are suffering from severe form of altitude illnesses and complications of pre-existing diseases. Our study witnessed 1 death (brought dead) and 10 (18.18%) patients with potentially fatal HACE and HAPE along with 5 (9.09%) patients with cardiovascular and neurological complications. In addition, majority of the patients were first timers in

the high altitude and almost all of them were clueless about the use of preventative measures.

There is no denial that the availability of the transportation system has significant socioeconomic impact in the local populations' daily life. Destinations which were days-weeks far are now easily accessible. It has also made life easier for the locals by transporting goods up and down, performing prompt descent to healthcare centers for medical care and evacuation of patients with other medical emergencies like obstetric emergencies, polytrauma. However, anyone who travels to these destination and are new to the high altitude should keep in mind the potential dangers of rapid ascent.

CONCLUSIONS

We conclude that majority of pilgrims seeking medical attention following rapid ascent to high altitude were diagnosed with some form of altitude illness and burden of severe form of altitude illness (HACE and HAPE) is high. Hence, proper planning of the trip and public awareness about slow and gradual ascent profile must be spread widely to make the travel to high altitude destinations safer.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

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