

**EFFECT OF HIGH ALTITUDE ON ERECTILE FUNCTION IN OTHERWISE HEALTHY INDIVIDUALS****Usama Bin Zubair, Humza Mumtaz\*, Ahmed Shoib Tabassum\*\***

Mujahid Force Center Bhimbher Pakistan, \*144 Medical Battalion Goma Siachin Pakistan, \*\*Armed Forces Institute of Mental Health Rawalpindi Pakistan

**ABSTRACT****Objective:** To determine the effect of high altitude on Erectile function in otherwise healthy individuals and associated socio demographic factors.**Study Design:** Cross sectional descriptive study.**Place and Duration of Study:** January 2014 to March 2014 at Goma, Siachin.**Material and Methods:** One hundred & twenty two married male subjects living at an altitude of more than 15000 feet for more than 3 month and less than one year were included in the study. Erectile dysfunction (ED) was assessed using International Index of Erectile Function-5 (IIEF-5). Age, education, smoking, monthly income, any drug intake, altitude, duration of stay and weather conditions were correlated independently with ED.**Results:** Out of 122, 26 (21.3%) had no ED, 18 had mild, 28 (14.8%) had mild to moderate, 36(29.5%) had moderate and 14 (11.5%) had severe ED. Advancing age, low monthly income, smoking, high altitude, cold weather and longer duration of stay had significant association with ED ( $p$ -value<0.05) while education and use of any drug were not found significantly associated in our study.**Conclusion:** This study showed a high prevalence of erectile dysfunction among otherwise healthy individuals when exposed to high altitude. Special attention should be paid on individuals with more age, less income and those working or residing at higher altitudes in peak winter season. Smoking and stay for longer durations should also be discouraged.**Keywords:** Erectile dysfunction, High altitude, Male, Socio demographic factors.

---

This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

---

**INTRODUCTION**

Erectile dysfunction (ED) is defined as the inability to obtain and maintain an erection sufficient for satisfactory intercourse or other sexual expression. It is the whole-body health problem facing men. Any compromise in erection quality can have a strong negative impact on quality of life.

ED is a highly prevalent health problem that affects ≈30 million men in the USA. It is a common worldwide clinical problem, with tens of thousands of new cases per year<sup>1</sup>. ED is associated or part of various medical conditions like cardiovascular disease<sup>2</sup>, Diabetes Mellitus<sup>3</sup>, chronic obstructive pulmonary disease<sup>4</sup>, chronic renal failure<sup>5</sup>, depression and anxiety<sup>6</sup> etc.

Higher altitudes (HA) bring about various

changes in physiology of the body due to decreased atmospheric pressure and less oxygen tension. As the human body goes beyond 7,000 feet above sea level, the saturation of oxy hemoglobin begins to fall<sup>7</sup>. However, the human body has both short-term and long-term adaptations to altitude that allow it to partially compensate for the lack of oxygen. This chronic hypoxia can lead to or aggravate multiple medical problems including heart problems, sleep apneas, diabetes, hypertension, arteriosclerosis and sexual dysfunction.

Very few studies have been done in past to establish the effect of HA on erectile function. A study done in china on patients of chronic prostatitis living at HA concluded that prevalence and severity of sexual dysfunction are positively correlated with the living altitude among chronic prostatitis patients<sup>8</sup>. Physical exercise at HA was found associated with a testicular dysfunction leading to reduced sperm concentration in a study done in Italy<sup>9</sup>. Role of hypoxia in ED was established by studying group of

---

**Correspondence:** Dr Usama Bin Zubair, House No 222, Lane No 10, Askari- 13, Pakistan (Email: [usamabinzubair@yahoo.com](mailto:usamabinzubair@yahoo.com))

Received: 24 Oct 2014; revised received: 19 Mar 2015; accepted: 24 Mar 2015

patients at different heights in our region by V Verratti et al. in Karakorum-Baltoro Expedition 2004<sup>10</sup>.

Homeostasis at HA in all the organ functions including sexual function is maintained by adaptation phenomenon. A study done in Japan regarding changes in Male Reproductive Function after HA Mountaineering showed that functions decreased from first to third month but came back to normal after two years<sup>11</sup>.

Advancing age, smoking<sup>1,3,12</sup>, Increase in height and duration of stay are associated with change in sexual function<sup>10,11</sup>.

It is a well-documented fact that ED may lead to an impaired quality of life and is linked strongly to life satisfaction<sup>13,14</sup>.

A large number of people are employed temporarily at HA. Armed forces of Pakistan are particularly engaged in high altitude warfare which is unique in its kind and probably engaged at one of the highest battlegrounds. Tourism and Mountaineering also engage a lot of people to work there so our study aimed to assess the erectile dysfunction and its correlates among male population living temporarily at HA.

## MATERIAL AND METHODS

This cross sectional descriptive study was conducted at Goma Siachin from 1<sup>st</sup> January 2014 to 31<sup>st</sup> March 2014. Random sampling was done. Male subjects between the age of 25 and 40 years who had been living at high altitude (more than 15000 feet) for more than three month and less than one year and have given written informed consent were included in the study. Non consenting subjects and those with age less than 25 or more than 40 were excluded from the study. Subjects living there for less than three months or more than one year or permanent residents of that area or those who were unable to understand /complete the required questionnaire were also excluded. Subjects with any physical or psychiatric illness were also excluded from the study. After the application of inclusion and exclusion criteria, 122 subjects were included in the analyses. Different methods and questionnaires are used for assessment of ED. We used International Index of Erectile Function (IIEF-5) which is most commonly used. Validated Urdu version was applied<sup>15</sup>. It is interpreted as follows:

1-7: Severe ED

8-11: Moderate ED

12-16: Mild-moderate ED

17-21: Mild ED

22-25: No ED

The sample was drawn from the people living in Goma, Siachin and fulfilling the inclusion criteria. After written informed consent IIEF-5 questionnaire was administered to the subjects under supervision of a health professional who translated or explained the questionnaire to those who had ambiguity in any point. Subjects were asked to answer the questions according to their condition after descent and regular living with the spouse.

Personal data correlating factors such as Age, education, any drug using, monthly income, and smoking, duration of stay, altitude and weather conditions were filled by the patient on a separate Performa attached to the IIEF questionnaire.

Descriptive statistics were used to describe the characteristics of participants and the distribution of IIEF score. Variables in this study included Age, education, smoking, monthly income, any drug intake, altitude, duration of stay and weather conditions. Between-group variances in categorical correlates were determined using chi-square.

All statistical analysis was performed using Statistics Package for Social Sciences version 20.0. Chi-square test was used and differences between groups were considered significant if *p*-values were less than 0.05.

## RESULTS

122 subjects were included in the study. All were married males. Out of these 122 subjects 26 (21.3%) had no ED, 18 had mild, 28(14.8%) had mild to moderate, 36(29.5%) had moderate and 14(11.5%) had severe ED. Advancing age, low monthly income, smoking, high altitude, cold weather and longer duration of stay had significant association with ED (*p*-value<0.05) while education and use of any drug were not found significantly associated in our study (*p*-value>0.05).

## DISCUSSION

Our study is unique in a sense that it helps in understanding the effect of stressful and unusual environment of high altitude on erectile function. 78.7% of participants of our study showed some level of ED at high altitude. No population based study

available on ED in Pakistan however Shaeer et al. reported that prevalence of ED among men attending as well as foreign data<sup>18, 19</sup>. ED and psychiatric problems have a strong correlation<sup>6</sup>. A positive

**Table. Characteristics of the study group and their IIEF score.**

Socio demographic factors	No ED (22-25)		Mild ED (17-21)		Mild to Mod ED (12-16)		Moderate ED (8-11)		Severe ED (1-7)		p-value
	N	%	N	%	N	%	N	%	N	%	
<b>Total</b>	<b>26</b>	<b>21.3</b>	<b>18</b>	<b>14.8</b>	<b>28</b>	<b>23</b>	<b>36</b>	<b>29.5</b>	<b>14</b>	<b>11.5</b>	
Age											
25-35	26	100%	14	77.8%	26	92.8%	26	72.2%	04	28.6%	0.00
>35	0	0%	04	22.2%	2	.2%	10	27.8%	10	71.4%	
Education											
10 or less	21	80.8%	17	94.4%	22	78.6%	34	94.4%	14	100%	0.056
>10	05	19.2%	01	5.6%	06	21.4%	02	5.6%	0	0%	
Duration of stay											
3-6 months	22	84.6%	14	77.8%	26	92.8%	26	72.2%	07	50%	0.024
>6 months	04	15.4%	04	22.2%	02	7.2%	10	27.8%	07	50%	
Altitude at which stayed											
15-18000 feet	26	100%	8	44.4%	22	78.6%	14	38.8%	2	14.3%	0.00
>18000 feet	0	0%	10	65.6%	06	21.4%	22	61.2%	12	85.7%	
Family income											
<12000	0	0%	04	22.2%	02	7.2%	08	22.2%	12	85.7%	0.00
12000 or more	26	100%	14	77.8%	26	92.8%	28	77.8%	02	14.3%	
Tobacco smoking											
Non Smoker	22	84.6%	12	66.7%	18	64.3%	10	27.8%	00	0%	0.00
Smoker	4	15.4%	06	33.3%	10	35.7%	26	72.2%	14	100%	
Any drug using											
No	20	76.9%	18	100%	26	92.8%	34	94.4%	12	85.7%	0.061
Yes	06	23.1%	00	0%	02	7.2%	02	5.6%	02	14.3%	
Weather during which stayed											
Summers	24	92.3%	08	44.4%	08	28.6%	04	11.1%	04	28.6%	0.00
Winters	02	7.7%	10	55.6%	20	71.4%	32	88.9%	10	71.4%	

primary-care clinics in Pakistan is 80.8%<sup>16</sup>. A population based study done in neighboring country china revealed that prevalence of ED is 28.3%<sup>17</sup>. Therefore our results are very much closer to a true reflection of effects of high altitude on erectile function as our study sample had no diagnosed physical or mental illness. Important reason may be chronic hypoxia<sup>10</sup> or mental health issues encountered commonly at unusual and stressful environments like high altitude where one is always exposed to extreme weather and danger of survival especially temporary inhabitants like subjects of our study.

Presence of high psychiatric morbidity among people exposed to high altitude is supported by local

feedback cycle sometimes develop between the two which becomes very annoying for the patient and a challenge for health care physicians<sup>6</sup>. Though scope of our study is not to look for any psychiatric morbidity at high altitude but ED being such a complex neuroendocrine, vascular and psychological disorder needs discussion from this point of view as it is easier for the health professionals to declare the people fit physically and send them to high altitude but difficult for them to screen for mental health issues and even at high altitude the patient himself is usually unable to comprehend the psychosomatic issues which may give rise to multiple problems including ED.

Increasing age in accordance with most of the available literature was significantly correlated with ED in our study population<sup>1,12</sup>. Education in our study sample was not significantly correlated with ED. A large study done by Shiri R et al also showed the same results<sup>20</sup>. Health related issues and duration of stay at high altitude is an interesting phenomenon which needs a lot of research. Longer stay can raise more problems due to chronic hypoxia as well as psychological issues but on the other hand process of acclimatization can help the person to overcome these problems. Our inclusion criteria involved subjects with duration at high altitude from 3 to 12 months and results showed that longer duration of stay is significantly correlated with ED. Hormonal basis of decline in sexual function at different time durations can be assessed from a study involving serum testosterone levels. It revealed slightly decreased testosterone in the blood after 1 month, which had decreased still further after 3 months. The tests were completely normal after 2 year<sup>11</sup>.

Smokers in our study showed more chances of having ED. Similar results are revealed in other studies regarding relationship of ED and smoking<sup>2, 12, 20</sup>. We could not find any association of drug intake and ED as most of our subjects refused the use of any drug intake. Few were taking were multivitamins. Those taking medicine for chronic illnesses could not meet the inclusion criteria so were not part of the study.

Winter season was very strongly associated with ED in the study sample. Mental health problems may be reason for this as all hazards of HA increase in winters. Prevalence and severity of ED was increased with increase in altitude in our study. Similar results are reported in the studies done internationally<sup>8,10</sup>.

Our study has few limitations as well. Randomized selection of study subjects from all the people living temporarily in this area was not done. Therefore, the results of the present study cannot be generalized. We used the cross-sectional study method so the cause and effect relationships remain unclear and further studies to look into these associations using longitudinal epidemiological data are suggested.

## CONCLUSION

This study showed a high prevalence of decline in erectile function among otherwise healthy individuals when exposed to high altitude. Special attention should be paid on individuals with more

age, less income and those working or residing at higher altitudes in peak winter season. Smoking and stay for longer durations should also be discouraged. Both physical and mental health should be periodically assessed of all the people sent to high altitudes.

## CONFLICT OF INTEREST

This study has no conflict of interest to declare. Abstract and results of this study were accepted and presented in an oral presentation at the International conference on Medical Education, organised by Association for Excellence in Medical Education(AEME) and held on 07<sup>th</sup>-09<sup>th</sup> March 2014 at University of Health Sciences(UHS) Lahore, Pakistan. No funding was received from any agency or institution.

## REFERENCES

1. Feldman HA, Goldstein I, Hatzichristou G. Impotence and its medical and psychosocial correlates: results of the Massachusetts Male Aging Study. *J Urol* 1994, 151:73-80
2. Gandaglia G, Briganti A, Jackson G, Kloner RA, Montorsi F, Montorsi P et al. A Systematic Review of the Association between Erectile Dysfunction and Cardiovascular Disease. *Eur Urol*. 2013; 23. S0302-2838 (13)00851-8.
3. Babu Lal Meena, Dhanpat Kumar Kochar, Tulsı Das Agarwal. Association between erectile dysfunction and cardiovascular risk in individuals with type-2 diabetes without overt cardiovascular disease. *Int J Diabetes Dev Ctries*. 2009 Oct-Dec; 29(4): 150-154.
4. Collins EG, Halabi S, Langston M, Schnell T, Tobin MJ, Laghi F. Sexual dysfunction in men with COPD: impact on quality of life and survival. *Lung*. 2012 Oct;190(5):545-56.
5. Anees M, Mumtaz A, Barki MH, Ibrahim M, Hussain S, Uzair M et al. Sex hormones and erectile dysfunction in hemodialysis patients. *Pak J Med Sci* 2009; 25(6):922-27.
6. Stuart N. Seidman, MD, and Steven P. Roose, MD. The Relationship Between Depression and Erectile Dysfunction. *Current Psychiatry Reports* 2000, 2:201-205.
7. Young, Andrew J; Reeves, John T. (2002). "Human Adaptation to High Terrestrial Altitude". *Medical Aspects of Harsh Environments 2*. Borden Institute, Washington, DC. Retrieved 2009-01-05.
8. Lan T, Wang YM, Chen Y. Investigation of sexual dysfunction among chronic prostatitis patients in high altitude area. *Zhonghua Nan Ke Xue*. 2009 Oct;15(10):886-90.
9. Pelliccione F, Verratti V, D'Angeli A, Micillo A, Doria C, Pezzella A, et al. Physical exercise at high altitude is associated with a testicular dysfunction leading to reduced sperm concentration but healthy sperm quality. *Fertil Steril*. 2011;96(1):28-33.
10. Verratti V, Di Giulio C, Berardinelli F, Pellicciotta M, Di Francesco S, Iantorno R, et al. The role of hypoxia in erectile dysfunction mechanisms. *Int J Impot Res*. 2007;19(5):496-500.
11. Akiou Okumura, Hideki Fuse, Yoko Kawauchi, Ichiro Mizuno, Takuya Akashi. Changes in male reproductive function after high altitude mountaineering. *High Altitude Medicine & Biology*. August 2003, 4(3): 349-53.

12. Mulligan T, Retchin SM, Chinchilli VM, Bettinger CB. The role of aging and chronic disease in sexual dysfunction. *J Am Geriatr Soc* 1988, 36:520-524.
  13. Abdo CH, Afif-Abdo J, Otani F, Machado AC. Sexual satisfaction among patients with erectile dysfunction treated with counseling, sildenafil, or both. *J Sex Med*. 2008;5(7):1720-6.
  14. Mark S Litwin, Robert J Nied, Dhanani N. Health-Related Quality of Life in men with erectile dysfunction. *J Gen Intern Med*. 1998; 13(3): 159-166.
  15. Mahmood MA1, Rehman KU, Khan MA, Sultan T. Translation, cross-cultural adaptation, and psychometric validation of the 5-item International Index of Erectile Function (IIEF-5) into Urdu. *J Sex Med*. 2012 Jul;9(7):1883-6.
  16. K.Z. Shaer, D.N. Osegbe, S.H. Siddiqui, A. Razzaque, D.B. Glasser, V. Jaguste. Prevalence of erectile dysfunction and its correlates among men attending primary care clinics in three countries, Pakistan, Egypt, and Nigeria *Int J Impot Res Suppl*, 1 (2003), pp. S8-S14.
  17. Quan Bai, Qing-Quan Xu, Hui Jiang, Wei-Li Zhang, Xing-Huan Wang, Ji-Chuan Zhu. Prevalence and risk factors of erectile dysfunction in three cities of China: a community-based study. *Asian J Androl* 2004 Dec; 6: 343-348.
  18. Bashir K. Psychiatric morbidity amongst the troops deployed at siachen. *PAFMJ*, 2008; 58( 1).
  19. Walton T. Roth, Annette Gomolla, Alicia E. Meuret. High altitudes, anxiety, and panic attacks: Is there a relationship. *Depression and Anxiety*. 2002; 16:51-58 .
  20. Shiri R1, Koskimäki J, Hakama M, Häkkinen J, Huhtala H, Tammela TL, et al. Effect of life-style factors on incidence of erectile dysfunction. *Int J Impot Res*. 2004; 16(5):389-94.
-