
MEDICAL SCIENCES

Assessment of Psychological Health and Morbidity, Adaptation and Cognitive Functioning During 27th Indian Antarctic Expedition

Sudhir K Khandelwal¹ and Abhijeet Bhatia²

¹All India Institute of Medical Sciences, New Delhi

²National Centre for Antarctic and Ocean Research, Goa

ABSTRACT

Antarctic expeditions of all nations have reported similar psychological problems due to prolonged isolation, confinement within small groups and restricted leisure. The present study has carried out a longitudinal assessment of members of the 27th Indian Expedition to Antarctica. Their general and psychological health, cognitive functioning, inter personal adjustments, level of motivation, consumption of tobacco and alcohol as a coping-strategy have been observed and analyzed

Keywords: Antarctica, Expedition, Psychological Health, Profiling.

1.0 INTRODUCTION

Ever since man has stepped on the shores of Antarctica, it has opened a vast field of research in various scientific disciplines including health. Antarctica has been described as a natural laboratory for studying the stresses on health and human performances, associated with isolation, in extreme conditions. Its environment is described as being extreme because survival is impossible for the unprotected and ill-provisioned individual (Decamps and Rosnet, 2005). Its natural environment being dangerous and not easily accessible makes it stressful.

However, physical characteristics of the polar-environment are not the strongest stressors that may be encountered by the individuals in Antarctica. Psychological aspects bring about varied kind of difficulties and reactions for people who stay there on short-term or long-term basis. Three main factors are described (Decamps & Rosnet, 2005) by long-term visitors (Winterers) as being most difficult to cope with: prolonged isolation or separation from family and friends; confinement in small groups restricting privacy; and occupation concerning group activities, restricted leisure activities and periods of high work load.

1.1 Global Research on Psychological Impact in Other Polar Expeditions

Many studies (Gunderson, 1974; Nadine et al, 1962 ;Strange and Klein, 1973; Natani&Shurley, 1974; Bhargava et al, 2000) have reported on several symptoms in polar winterers, the most frequent being insomnia, irritability, headaches, anxiety, feelings of depression, lack of motivation, concentration difficulties etc. Psychopathological reactions such as schizophreniform reactions, paranoid reactions, or obsessions are very rare, seen in less than 2% of the winterers. Though minor mental health problems are very common, they are temporary, and cause only 4-5% of the total health related morbidity (Lug, 1991).

Numerous studies have also suggested that psychological reactions during isolation follow sequential patterns (Kanas & Federsen, 1971; Plinks et al, 1998; Palmai, 1963). Bechtel and Berning (1990) described three stages : a) increased anxiety, b) depression and settling down to routine and c) emotional outbursts, aggressiveness, open conflicts, and decreased motivation and morale. This last and most critical stage occurs around the third quarter of the isolation period and has been termed 'the third quarter phenomenon'. This third quarter phenomenon has been observed in several different types of isolated and confined environments (Earls, 1969; Jackson et al, 1972; Palmai, 1963), but some studies have reported no significant decrements in behaviour and performance during long duration missions (Gazenko, 1982; Steal & Suedfeld, 1991). The importance of these problems is that they can pose a serious threat to the group solidarity and harmony.

Palinkas and Housel (2000) studied seasonal variation on longitudinal basis in mood and behaviour in American men and women. There was a significant decline in tension anxiety, depression, anger, confusion and fatigue from March to August; followed by a significant increase in tension/anxiety and fatigue and a significant decline in vigor from August to October. Despite the extensive research conducted on these symptoms and their relationship to patterns of adaptation and adjustment to the prolonged isolation, confinement and exposure to extreme environmental conditions, the etiology of the winter-over syndrome remains mystery. Significant increase in prevalence of sub syndromal seasonal affective disorder suggests the role of certain environmental factors like lack of stimulation and prolonged exposure to constant darkness. Many of the physical changes associated with prolonged exposure to such an environment, like alteration in thyroid hormones, are

known to be associated with increased depressive symptomatology and disruption of cognitive performance.

Steel (2001) while studying the mood changes in the third-quarter found that negative mood or displeasure seemed to increase only slightly and did not indicate any extreme or long term negativity. Mocellin and Suedfeld (1991) also concluded that polar experience was not generally aversive and stressful. Palinkas (1992) also described long term positive effects of wintering work.

1.2 National Research on Psychological Impact in Indian Polar Expeditions

Limited, but significant, work has been done at Maitri, the Indian Antarctic Station. Bhargava et al (2000) have described in detail the psychological impact on 25 men who participated in the winter-over team of 11th Indian expedition to Antarctica in 1991, for possible association with seasonality and isolation. It was found that increased cigarette smoking was associated with the stress of the beginning of isolation (March), sleep difficulty was associated with mild winter (June), rapport was at minimum at the point of maximum isolation in temporal terms (September) and decreased satisfaction with work in life situation was associated with continued isolation (December, January). The study suggested that variables postulated to affect performance undergo changes during the course of wintering over in Antarctica. The authors themselves have pointed out a number of shortcomings and limitation of this study: small sample size, lack of standardized assessment instrument, incomplete coverage of relevant variables, and lack of information regarding concerned behavioural pattern. Joshi et al (1998) identified isolation and extreme environmental conditions as significant stresses in Antarctica, and coping resources of the expedition members changed during different periods of the expedition. Mehta (2002) reported on a combined sample of 46 members of the 15th winter over expedition and summer team of 18th expedition. The aim of the study was to find significant stresses and to determine the impact of stressors on socialbehaviour. The study concluded that the responses to stresses differed due to individual personality and coping ability. With proper screening and psychological preparation of individuals, these problems could be minimized.

In view of the above information and research findings, the present study was planned to carry out a structured and longitudinal assessment of all the members of the 27th Indian Expedition to Antarctica, starting

in December 2007, with a view to study changes in their general and psychological health, cognitive functioning, inter personal adjustment, level of motivation and consumption of tobacco and alcohol as a coping-strategy during their entire stay at Maitri station.

2.0 AIMS AND OBJECTIVES

- i) To make structured and longitudinal assessment of general health and psychological changes among members of Indian expedition to Antarctica.
- ii) To study changes in cognitive functions of members on longitudinal basis.
- iii) To study changes in motivation during the entire period of stay at Maitri station.
- iv) To study pattern of cigarette smoking and alcohol consumption as a way of coping, during the entire period of stay at Antarctica.

2.1 Inclusion Criteria

All the members of Indian expedition to Maitri station, Antarctica; except the doctor of the team; who was trained to carry out various assessments during the entire period of stay.

2.2 Exclusion

Any member who was not willing to give informed consent for these assessments.

2.3 Instruments of Observation

- i) Sociodemographic proforma
- ii) General Health Questionnaire - 30 item version: for assessment of general and psychological health
- iii) Mini-Mental Scale Examination and PGI Memory Scale for assessment of cognitive functions
- iv) Motivation scale
- v) Assessment of cigarette smoking by Faegerstorm Test for Nicotine Dependence (FTND)
- vi) Assessment of alcohol consumption by Alcohol Use Disorder Identification Test (AUDIT)

3.0 METHODOLOGY

All the members of the expedition were explained in detail the purpose of the study and informed consent was obtained. The Principal Investigator (PI) familiarized himself with the expedition team during its Pre-Antarctic and Snow Training camp at Auli (Uttarakhand). The investigator also explained in detail the purpose of the study to the team doctor, Dr Abhijeet Bhatia, and elicited his cooperation and willingness for carrying out the assessment during winter-over period. The team doctor was also trained in the administration of various questionnaires, before the final departure to Antarctica, at the Department of Psychiatry, All India Institute of Medical Sciences, New Delhi. Inter-rater reliability was established. All the team members of the expedition were subsequently administered each questionnaire every two months for the entire duration of the expedition.

4.0 DISCUSSION AND CONCLUSIONS

4.1 Results for the Summer Team

The present study was carried out at Indian Antarctic station, Maitri (70°45'S, 11°45'E) among 31 members of the summer team of the 27th Indian Antarctic Expedition, with the aim of making structured assessment of their general health and psychological adaptation. They were also assessed for any change in tobacco and alcohol consumption as a way of coping in Antarctica. Assessment was done by General Health Questionnaire, Mini-mental State Examination, PGI Memory Scale, Faegerstrom Test for Nicotine Dependence and Alcohol Use Disorder Identification Test. All the members were assessed twice on above questionnaires at the beginning and end of their expedition.

All members were males. Their mean age was 37.7 years. The total duration of expedition was 162 days, out of which members spent a minimum of 87 days below the latitude of 40° South (range 87-141 days).

Majority of the members experienced nausea and lack of appetite during rough weather in Antarctic Ocean, when the ship went through rolling and pitching. This was self-limiting, and none required any specific medical intervention. Twelve members experienced increase in body weight, while no member had any significant weight loss. None of the members experienced any significant change in any bodily systems, though one member suffered sprain of wrist due to fall, while negotiating climb on a snow covered hill. There was no excessive use of tobacco,

while frequency of social alcohol drinking increased with no adverse consequences. Assessment of cognitive functions revealed no decline, while motivation and efficiency, on self-report, remained high during expedition for the entire group.

Initially, the tobacco consumption showed signs of increasing, which during later months it seemed to have plateaued. Alcohol consumption did not increase. Initially, social dysfunction, anxiety, depression tended to increase, but that did not lead to any functional impairment. The anxiety and depression did not require any medical intervention. Social dysfunction did not lead to any act of indiscipline, or obvious confrontation among team members. Some of the members had increased somatic concerns related to sleep, headache or gastro-intestinal symptoms, but these were not significant needing any medical intervention, and members seemed to have adjusted to these.

To conclude, the members of the summer team did not reveal any obvious signs of stress on their physical or psychological health, while their motivation remained high.

4.2 Results for the Wintering Team

Wintering over in Antarctica is a challenge of a high order. A study of the psychological adaptive processes to prolonged residence under unique conditions prevalent there provides invaluable insights into the behavior of communities living under similar conditions. The results reveal that among the GHQ subscales, somatic reactions (GHQ 1) and social dysfunction (GHQ 3) scores peaked during the mid-winter, whereas insomnia and anxiety (GHQ 2) scores peaked during the coldest part of the winter. Severe depression (GHQ 4) scores did not change significantly during the expedition. PGI memory scale and HMSE scores, the two measures of cognitive behavior gave conflicting results; HMSE score was lowest during the period just before departure from Antarctica, whereas PGI memory scale scores did not change significantly. Tobacco consumption too did not change significantly during the expedition. Paradoxically, however, alcoholism was noticed to decrease during the course of the expedition. The well being scale scores did not change significantly.

Severe depression scores did not vary significantly during different phases of prolonged Antarctic residence. Somatic symptoms and social dysfunction are externalized reactions, whereas Insomnia and anxiety might be considered as internalized reactions. The above results show that the internalized reactions were maximum in a later spell, than the more visible

externalized reactions. Severe depression did not change significantly probably because the winter activities were planned well in advance and kept most of the team members reasonably occupied. The team members picked up new skills during this period. Cognition, including memory was assessed by the PGI memory scale and HMSE. The two instruments gave conflicting results; the PGI memory scale scores did not change significantly during the course of the expedition, whereas the HMSE scores changed significantly. However, it was observed that the HMSE score fell sharply only during the Nov 2008 spell. Thus, the changes in cognition cannot be deemed to be conclusive.

Out of the two instruments used for measuring alcohol dependence, CAGE scores did not change significantly, whereas the AUDIT score was highest on arrival on the continent and then decreased with a lesser peak during the Aug 2008 spell. Alcohol consumption decreased during the expedition, because although alcohol is made available in the expedition in adequate quantities, its distribution is restricted by the Expedition Leader and it is served in limited doses. Alcohol is served as a leisure activity and to promote social interactions in the expedition. However, irresponsible drinking, which might be precipitated under stressful conditions on the continent, coupled with underemployment, might impede team performance and well being.^{7,28} Previous studies have reported variable patterns of alcohol consumption. An Indian study on winter expeditioners reported no seasonal variation in alcohol consumption, whereas an American study showed seasonal variation. Environmental, cultural and demographic factors were deemed to be responsible for different outcomes.⁶

Tobacco consumption did not show any significant seasonal variation during the study as measured by FTND. In the 27th expedition, tobacco consumption was in the form of smoking (cigarettes and bidis) and chewing. Like alcohol, various studies reported variable patterns of tobacco consumption. Tobacco consumption did not change during the current study, because of limited personal stocks available with the team members. Smoking is not encouraged in the expedition and is permitted only in designated areas of the station, because of the fire hazard. Tobacco is not available in the expedition. The Indian study by Bhargava et al reported a gradual decrease in smoking, with a sudden spike towards the end of the expedition. They attributed this observation to increased anxiety levels towards beginning and end of the wintering period.⁶ However, in the current study, though anxiety levels showed significant variation (GHQ 2), tobacco consumption did not. Excessive smoking and alcohol consumption represent manifestations of underlying

psychological reactions. However, these could not manifest in the 27th expedition because of restricted availability.

5.0 SUMMARY

It can be surmised from the above discussion that alcohol consumption was maximum during the initial days of arrival on the continent and decreased thereafter, with another spike during the peak of the winter season. Externalized psychological reactions (somatic symptoms and social dysfunction) peaked during the mid-winter period. Internalized psychological reactions showed variable results: anxiety and insomnia peaked during the coldest period, whereas depressive symptoms did not change throughout the expedition. Cognition was at its worst during the final phase of Antarctic residence. Thus each phase of Antarctic residence had its own set of psychological reactions. The predominance of psychological reactions during the third quarter of the isolation period, (coinciding with the peak of the winter in the months of July and August) as observed by earlier authors, was not validated by this study. There are now an increasing number of studies disputing the third quarter phenomenon². This is because with increasing number of Antarctic stations, multi-centric studies are now possible. Long-term study at the same station can also be carried out, though not on the same set of subjects. The data that can now be generated is more likely to present a true representation of the enigma of prolonged isolation in extreme conditions. With the operationalization of its third Antarctic station, Bharti, researchers from India are also in a position to conduct multicentric and longer term studies on the subject.

REFERENCES

- Bechtel, R., & Berning, A. (1991). The third quarter phenomenon: Do people experience discomfort after stress has passed? In A. Harrison, Y. Clearwater, & C. McKay (Eds.) *From Antarctica to outer space : Life in isolation and confinement* (pp. 260-265) New York : Springer Verlag.
- Bhargava R, Mukerji S and Sachdeva U (2000) Psychological impact of the Antarctic winter on Indian expeditioners. *Environment and Behaviour*, 32, 111 - 127.
- Decamps G and Rosnet, E (2005). A longitudinal assessment of psychological adaptation during winter-over in Antarctica. *Environment and Behaviour*. 37, 418 - 435.
- Earls, J.H. (1969). Human adjustment to an exotic environment : The nuclear submarine. *Archive of General Psychiatry*, 20, 117-123.
- Gazenko, O.G. (1982). Investigations in outer space conducted in the USSR during 1982. *Aviation. Space and Environmental Medicine*, 54, 949-951.

- Gunderson, E.K.E (1968). Mental health problems in Antarctica. *Archives of Environmental Health*, 17, 558-564.
- Jackson, J.K., Wamsley, J.R., Bonara, M.S. & Seeman, J.S. (Eds.) (1972). Program operational summary : Operational 90-day mammed test of a regenerative life support system (NASA CR-1835). Washington, DC : National Aeronautics and Space Administration.
- Kanas, N., Salnitskiy, V., Weiss, D., Grund, E., Gushim, V., Kozerenko, O., et al. (2001). Crewmember and ground personnel interactions over time during Shuttle-Mir space, and *Environmental Medicine*, 72, 453-461.
- Lugg, D. (1977). Physiological adaptation and health of an expedition in Antarctica, with comment on behavioral adaptation (ANARE Scientific Reports, Series B(4) Medical Science, Publication 126) Canberra : Australian Government Publishing Service.
- Mocellin, J., 7 Suedfeld, P.(1991). Voices from the ice : Diaries of polar explorers. *Environment and Behavior*, 23,704-722.
- Natani, K., & Shurley, J.T. (1974). Sociopsychological aspects of a winter vigil at south pole station. In E.K.E. Gunderson (Ed.), *Human adaptability to Antarctica conditions* (Antarctic research series, Vol.22, pp.89-114). Washington, DC:American Geophysical Union.
- Nardini, J.E., Herrmann, R.S., & Rasmussen J.E. (1962) Navy psychiatric assessment in Antarctic. *American Journal of Psychiatry*, 119, 97-105.
- Palinkas, L.A. Cravalho, M., & Browner, D. (1995). Seasonal variation of depressive symptoms in Antarctica. *Acta Psychiatrica Scandinavia*, 91, 423-429.
- Palinkas, L.A. & Houseal, M (2000). Stages of change in mood and behavior during a winter in Antarctica. *Environment and Behavior*, 32, 128-141.
- Palmai, G. (1963), Psychological observations on an isolated group in Antarctica *British journal of Psychiatry*, 109,364-370.
- Steel, G.D. (2001), Polar moods: Third quarter phenomena in the Antarctic. *Environment and Behaviour*, 33, 126-133.
- Steel G.D., & Suedfeld, P. (1991). Temporal patterns of affect in an isolated group. *Environment & Behaviour*, 23, 749-765.
- Strange, R.E, & Klein, W.J. (1973). Emotional and social adjustment of recent U.S. winter-over parties in isolated Antarctic stations. In O.G. Edholm & E.K.E. Gunderson (Eds.), *Polar human biology : Proceedings of the SCAR/UPS/UBS Symposium on human biology and medicine in the Antarctic* (pp. 410-416), Chicago : William Heinemann.
- Wood, J., Lugg, D.J., Hysong, S.J., & Harsong, S.J., & Harm, D.L., (1999). Psychological changes in hundred day remote Antarctic field groups. *Environment and Behaviour*, 31, 299-377.
-