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MEDICAL CONSULTANCY OF THE FIRST TURKISH ANTARCTIC RESEARCH EXPEDITION 2016

BİRİNCİ TÜRK ANTARKTİKA ARAŞTIRMA SEFERİ 2016'DA TIBBİ DANIŞMANLIK

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ABSTRACT
Objective: Antarctica is the coldest, farthest, and highest continent on Earth. Due to its extreme conditions and isolation, researchers undergo health assessments, which are prepared differently in each country. Health standards for National Arctic and Antarctic Polar Research Projects were prepared by our Faculty, and the scientists participating in the first national scientific expedition were assessed in the Department of Underwater and Hyperbaric Medicine.
Materials and Methods: After one year of investigation, National Turkish Polar Research Health Standards (TUKAS) were prepared. Medical assessment of the candidate researchers was done according to these standards in our hospital. All the physical examinations, laboratory and radiologic results were recorded. Researchers were monitored all through the expedition and any medical condition was recorded.
Results: Thirteen researchers attended the 1st Turkish Antarctic Scientific Expedition in 2016. Twelve researchers were assessed according to TUKAS. Cardiologic conditions were detected in four applicants. There was a history of tuberculosis in one applicant and hepatitis A and B in another. Also, there were minor gastrointestinal problems in three applicants. None of the detected conditions impeded participation. No serious health problems were reported during the expedition.
Conclusion: Team members who are to work in Antarctica should be selected carefully by taking into account a physical examination and medical conditions. Istanbul Faculty of Medicine, Department of Underwater and Hyperbaric Medicine has been selected for the examination of the Turkish team. Thus, the data, which will be kept in one center, will be an important resource for future scientific studies.
Key words: Antarctic regions; demography; health condition;

ÖZET
Amaç: Antarktika, Dünya'nın en soğuk, en uzak ve en yüksek kıtasıdır. Kıtada çalışacak olan araştırmacılar, buradaki olağandışı koşullar ve izolasyon nedeniyle tıbbi değerlendirmeden geçmektedir. Bu değerlendirme için her ülkenin kendi sağlık standartları bulunmaktadır. Ulusal Arktik ve Antarktik Kutup Araştırmaları Projeleri için sağlık standartları ise Fakültemiz tarafından hazırlanmıştır ve ilk Ulusal Antarktik Bilimsel Seferi'ne katılacak araştırmacıların tıbbi değerlendirmeleri Sualtı Hekimliği ve Hiperbarik Tıp Anabilim Dalı'nda yapılmıştır.
Gereç ve Yöntem: Bir senelik araştırma ve incelemeler sonunda Türk Ulusal Kutup Araştırmaları Sağlık Standartları (TUKAS) hazırlanmıştır. Aday araştırmacıların muayeneleri bu standartlara göre kliniğimizde yapılmıştır. Tüm muayene bulguları, laboratuar test ve radyolojik değerlendirme sonuçları kaydedilmiştir. Araştırmacılar sefer boyunca da takip edilmiş ve her türlü tıbbi sorun kayıt altına alınmıştır.
Bulgular: Birinci Ulusal Antarktik Bilimsel Seferi'ne on üç araştırmacı katılmış, bunlardan onikisi TUKAS'a göre tıbbi değerlendirmeden geçmiştir. Dört adayda kardiolojik durum saptanmıştır. Bir adayda tüberküloz, bir adayda ise Hepatit A ve B öyküsü vardır. Ayrıca üç adayda minör gastrointestinal problem olduğu görülmüştür. Saptanan bu durumların hiç birinin sefere katılmaya engel oluşturacak nitelikte olmadığı belirlenmiştir. Sefer sırasında da her hangi bir sağlık problemi yaşanmamıştır.
Sonuç: Antarktika'da çalışacak ekibin üyeleri fizik muayene ve tıbbi durumları dikkate alınarak özenle seçilmelidir. Türk ekibinin tıbbi değerlendirmesi için İstanbul Tıp Fakültesi, Sualtı Hekimliği ve Hiperbarik Tıp Anabilim Dalı

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seçilmiştir. Böylece bir merkezde toplanması sağlanan veriler ileride yapılacak bilimsel araştırmalar için iyi bir kaynak oluşturacaktır.
Anahtar Kelimeler: Antarktika; demografi, sağlık durumu; bilimsel sefer

INTRODUCTION

Antarctica, which has a fourteen million square kilometer area, is the farthest, coldest, and the fifth largest continent on Earth, and has the highest average altitude. The highest point is 4892 meters and the average altitude is 2010 meters. The average annual temperature is -10°C. In the interior areas, the average temperature is between -40 and -70°C in winter and between -15 and -35°C in summer. When compared with its eastern counterpart, the western part of the continent is less elevated and milder in terms of mean temperatures, air conditions, and precipitation. Some parts of the continent receive heavy precipitation (snowfall), whereas others have not received any for millions of years and are actually deserts (1).

The first data about the exploration of Antarctica dates back to the fifteenth century when fisherman and whale hunters traveled to the continent, but its popularity has risen in the last century. In 1959, 12 countries signed a treaty that banned military activity, mine hoisting, and oil and gas drilling on the continent. In the following years, more countries joined the treaty (1). The treaty is currently supported by 52 countries, one of whom is Turkey, which joined in 1995. With this treaty, the continent is preserved for scientific investigation, collaboration and peace (2). At present, 29 countries have 101 scientific research stations on the continent. Some of these are operated all year round, whereas others only seasonally (3).

The first documentation of Antarctica in our history is in the maps of Piri Reis, the famous Turkish cartographer of the fifteenth century. After Turkish researcher Atok Karaali, who conducted studies on the continent in 1968, many Turkish researchers have been to Antarctica for scientific purposes, but all on behalf of other country's projects. The first Turkish expedition was conducted in 2016 between March 29th and April 17th by a team that included 13 researchers from seven different universities and TUBITAK. The expedition route is given in **Figure 1**.

Figure 1: The expedition route

Health issues are important for research on Antarctic because the continent is distant and isolated; health facilities and centers are not easily accessible and environmental conditions are challenging. All countries that conduct projects on the continent have health standards for their researchers. A similar health standard for National Arctic and Antarctic Polar research projects was prepared before the first Turkish Scientific Expedition in 2016. Researchers who participated in the expedition were screened according to these standards.

MATERIALS AND METHODS

Thirteen researchers, two women and eleven men, participated in the 1st Turkish Antarctic Scientific Expedition in 2016. Researchers had an average age of 42±9 years, average height of 172±7.5 cm, average weight of 77.6±13.9 kg, and average waist circumference of 94.2±13.5 cm. The average body mass index was calculated as 26.0±3.4 kg/m^2. With the exception of one, all researchers were medically screened according to the National Turkish Polar Research Health Standards (TUKAS) before the expedition.

TUKAS, which took about a year to prepare, consists of six examination forms and a guide. The guide is for physicians and explains how the forms should be completed, aspects to be taken into account during examinations, and selection and elimination criteria for the expedition. Elimination criteria are divided as (1) absolute contraindications, (2) relative contraindications, and (3) temporary contraindication groups. In addition, the criteria also differ according to project's duration (long-short), season (summer-winter), area and exposure (west Antarctica/low altitude – inner continent/high altitude), task's content (diving-flying), and specificity of the scientist for the project.

The first of the six forms is a consent form, which gives information about the purpose of the examination and presents the possible health threats in an expedition. The applicant is expected to read, totally understand, and sign the form. Additional information is given if the applicant has specific functions such as diving or flying.

The second form is for personal data and health approval. The first part of this form requires personal data such as job, email and postal address, and previous expeditions, a photo of the applicant is provided and person to contact in case of emergency is recorded. In the second part, the examining physician's decision for fitness is given. Here, the decision is presented as accepted, conditionally accepted or rejected. If there is a conditional acceptance or rejection, an explanation about the reasons and conditions/ time for re-examination is provided below the decision. The third form is a detailed medical background form. Respectively, cardiovascular, respiratory, gastrointestinal, urinary, female and male genital, rheumatologic, musculoskeletal, neurologic, psychiatric, ophthalmologic, ear-nose-throat, endocrinologic, dermatologic, hematologic, and oncologic systems, and diseases specific to these systems are questioned. Regular medication is also recorded in this section. The fourth form is for family history. In this section there are questions regarding diseases that have genetic transmission. The fifth form is the system examination form, which is completed by the examining physician(s) to record their findings and laboratory test results. The last form is the dental examination form, which should be completed by a dentist.

RESULTS

Examination: Twelve scientists were examined. In the cardiovascular system examination, it was seen that one applicant had undergone coronary angioplasty two months previously, one applicant once had sinus tachyarrhythmia five years earlier, and one had benign left axis deviation, which was detected in electrocardiography (ECG). One of the applicants had experienced four supraventricular tachycardia attacks over a period of 20 years, but the situation was clearly under control. In the pulmonary system examination, it was found that one applicant had a positive tuberculosis (TB) test one year previously, and two applicants were suspected of having sleep apnea. Examination of the gastrointestinal system revealed that two applicants had undergone appendectomy surgery 27 and 50 years earlier, one applicant had hepatitis A and B more than 20 years ago, and two applicants had inactive gastritis and reflux esophagitis. In addition, one applicant was being treated for an active peptic ulcer that he had had for many years. In the urogenital system examination, one applicant had a urinary calculus, which was treated with ureteroscopy. One of the female applicants had a normal delivery 12 years ago. With regards to the musculoskeletal system, one applicant had femoral and another had forearm fractures in their childhoods. Three applicants had occasional lumbar pain, and one applicant had a neck hernia. Also, one applicant had a history of fluid loss in the knee, Achilles tendon shortness, and loss of range of joint movement. Neurologically, one applicant reported severe headache that was sometimes accompanied by light and sound sensitivity. In psychiatric examination, one applicant had obsessive compulsive disorder. Smoking addiction was present in four applicants of which, one had quit very recently. In the ophthalmologic examination, it was seen that six applicants had myopia or hyperopia. The ear-nose-throat examination revealed that one applicant had experienced hearing loss previously and two applicants had a history of tonsillectomy and septoplasty surgeries, respectively. In the dermatologic examination, one applicant had psoriasis. There were no other significant pathologies in the endocrinologic, hematologic, or oncologic examinations.

One of the applicants was on regular medication, clopidogrel. One applicant was taking calcium carbonate and heavy magnesium carbonate occasionally, and one was frequently taking naproxen sodium for headaches. In applicants' family history there were common diseases such as diabetes, hypertension, cardiovascular diseases, and cancer.

ECG analysis revealed suspected myocardial infarction (MI) in two applicants. One of the applicants reported that he had chest pain two months ago and underwent coronary angioplasty at a separate institution. MI was

not detected in further investigations then. A cardiac stress test and echocardiography were planned and performed for the other applicant and he was found cardiologically healthy. The third applicant whose ECG revealed abnormal findings had left anterior hemiblock, which had been present for a long time and declared benign. In the spirometric analysis, mild obstruction was detected in one applicant who was free of symptoms. In the audiometric analysis, bilateral moderate hearing loss that did not affect daily life was detected one applicant. Four applicants had clinically non-significant neutrophilia, neutropenia, lymphocytosis, and anemia, respectively, in their blood count. Biochemical analyses showed that three applicants had direct and indirect bilirubin level elevation, and seven applicants had high blood fats. A female applicant's urinalysis revealed bacteriuria.

Expedition findings: The scientists had no serious health problems during the Turkish Antarctic Research Expedition, 2016. Jet-lag did not develop after long flights. Sea conditions were very rough for three days to and six days from Antarctica. All scientists except two took dimenhydrinate but seasickness did not pose a significant problem for any scientist. No trauma was experienced during the studies on land.

DISCUSSION

Antarctica is still the most difficult areas to reach on Earth. While scientists work in this area, important problems can happen regarding medical care and help. Therefore, team members who are to work in Antarctica should be selected carefully by taking into account physical examinations and medical conditions. On the other hand, strict health criteria can cause some difficulties. Working on Antarctica includes scientific studies, so scientists cannot be selected from a large population. These scientists are usually older and this makes age-related diseases more common in this group because reaching scientific expertise level takes many years. Therefore, it is necessary to make health criteria optimal rather than strict. Antarctica, which is approximately 18 times larger than Turkey, is also larger than Europe and is the fifth largest continent. There are great differences of altitude and meteorological conditions between different areas on the continent. There are also seasonal differences in conditions because the continent is located at the South Pole. Therefore, characteristics for the scientific expedition such as season, duration and region of the continent, are important for health issue considerations. In general, the eastern and inner parts of the continent are more stringent in means of altitude and temperature. The west of the continent and the Antarctic Peninsula is located at low altitude and warm in summer weather especially. Medical examinations and criteria should be different for long-term stays, the winter period, altitude conditions and activities such as diving and flying. The 2016 Turkish Antarctic Research Expedition was accomplished in summer in the Antarctic Peninsula area and just for one week, which is why health and elimination criteria were held at a minimum level. If the expedition was planned for a different area or for a longer duration, some of the scientists who were accepted for the present expedition could have been eliminated after their present examinations.

The 2016 Turkish Antarctic Research Expedition was our country's first collective scientific expedition. Preparing health examination criteria before the Antarctica expeditions and performing examinations according to these criteria is important for future research. Also, it is important that Istanbul Faculty of Medicine, Underwater and Hyperbaric Medicine Department has been selected for the examination of scientists coming from various universities and parts of the country. Istanbul Faculty of Medicine, apart from being the first medical school in our country, has opportunities for consultation for every department. Istanbul Faculty of Medicine, Underwater and Hyperbaric Medicine Department has provided medical consultancy for activities in extreme conditions such as deep dives, caisson works and altitude works and have been performing the medical assessments of such workers. In addition, keeping medical records of Antarctica researchers in our university department will contribute to the medical studies of Antarctica expeditions.

CONCLUSION

Medical consultation was provided by Istanbul Faculty of Medicine for this first scientific expedition, which was delayed because Turkey signed the Antarctic agreement more than 20 years ago. Applicants were examined according to Turkish National Polar Research Health Standards (TUKAS), which were prepared solely for this purpose. Medical assessments for future expeditions will be performed in our Faculty. This will contribute to the prevention of health problems in such expeditions and the data, which will be kept in one center, will be an important resource for scientific studies.

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