ISSN: 0976-3031

International Journal of Recent Scientific Research

Impact factor: 5.114

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Volume: 6

Issue: 9

THE PUBLICATION OF
INTERNATIONAL JOURNAL OF RECENT SCIENTIFIC RESEARCH
http://www.recentscientific.com
E-mail: recentscientific@gmail.com

ISSN: 0976-3031

Available Online at http://www.recentscientific.com

International Journal of Recent Scientific Research
Vol. 6, Issue, 9, pp.6129-6133, September, 2015

International Journal of Recent Scientific Research

RESEARCH ARTICLE

# THE UNFIT FOR MILITARY SERVICES AMONG POTENTIAL NEW RECRUITS IN RIYADH KSA

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**ARTICLE INFO**

***Article History:***

Received 15th June, 2015
Received in revised form 21st July, 2015
Accepted 06th August, 2015
Published online 28st September,2015

***Key words:***

Unfit, Military Recruits, Sickle cell Disease, Colour Blindness, Retrospective Study,

**ABSTRACT**

**Objectives**

This study draws on a sample of male military recruits in Saudi Arabia as a proxy for the population more generally. It uses standard admission health checks to investigate health problems, including hereditary disease and substance misuse.

**Methods**

We adopted a retrospective review design involving 2,518 men who were new military recruits and were screened over 3 months from July to September 2014 in the Al-Morooj health center in Riyadh, Saudi Arabia. The research unit at the MSD collected the data through trained research assistants. The data entry and management was conducted by the first author. The results of the screening process using descriptive statistics, the Chi-squared test of association and odds ratios.

**Results**

Of the screened recruits, 4.7% were carriers or affected by sickle cell disease, 3.2% suffered from color blindness, 0.5% tested positive for hepatitis B and 0.1% tested positive for hepatitis C. 3.1% tested positive for illegal substances, with 90% of those testing positive for cannabis, and 10% for amphetamines. The Chi-squared test results showed statistically significant association between the region of residence and Sickle Cell Disease ($P<0.001$) Southern Region (OR=5.68) and the Eastern Region (OR=5.20). Region of residence and abnormalities in the left-eye ($P=0.048$) Western Region (OR=3.02).

**Conclusions**

The military screening program can be utilized as a useful tool for screening health status in the country if some of the limitations of this program are tackled efficiently.



## INTRODUCTION

Young Saudi adults have experienced better health services and a higher level of health awareness than their predecessors. The health service was still comparatively underdeveloped until the late 1980s, although efforts to improve it, have intensified in the last two decades(1). The government has prioritized healthcare services and continues to allocate increased funding each year (2). Despite these efforts, the healthcare system remains stretched (3). World Health Organization (WHO) statistics indicates that Saudi Arabia allocated approximately 3.1% of GDP to healthcare in 2014. This percentage is well below the 12.4% average of the group of high-income countries (G20) to which Saudi Arabia belongs. Saudi Arabia's average of 9.4 physicians per 10,000 populations is also below the G20 average of 27.1. It has only 22 beds per 10,000 population, compared to the G20 average of 56 per 10,000 (4). Another challenge is the ongoing change of disease patterns from communicable to non-communicable diseases due to lifestyle changes. This new challenge has increased the prevalence of chronic diseases such as hypertension, diabetes, cardiovascular disease, and cancer (5).

In addition to these, other persistent health challenges remain, such as obesity, sickle cell disease, and drug addiction (6, 7). These health challenges stem from social and cultural issues in the country and region (8, 9). These include marriage among relatives (extended family or the same tribe). This practice increases the chance of hereditary diseases such as sickle cell disease and color blindness (10, 11). Premarital screening for prospective husbands and wives was introduced in 2005, to increase public awareness of sickle cell disease, and decrease its incidence nationally. In an evaluation of the program after 6 years, Memish and Al-Saeedi reported that it had "markedly

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reduced the number of at-risk marriages, which may considerably reduce the genetic disease burden in Saudi Arabia in the next decades" (11).

Another program, also introduced in 2005, provided premarital screening for drug addiction. This program was initiated because of widespread drug addiction in Saudi Arabia, especially among young people (12, 13). However, a report from January 2014 suggested that officials were concerned that it had not been successful(12). At that stage, more than 2.5 million addiction tests had been carried out. Results suggested that Saudis accounted for over 54% of drug users in the kingdom and drug addiction among women had increased by 20% over the previous few years. 55% of drug addicts were aged between 19 and 30. The ministry found that addicts tended to abstain from taking drugs prior to getting married so they could pass drug tests, and then reverted to their addition once married (12). Drug addiction is becoming a very serious problem in the Middle East, especially in Saudi Arabia. Despite all intoxicants being categorically forbidden by Islam, including alcohol, "immense volumes" of illegal amphetamines are being seized in the Middle East, particularly Saudi Arabia, according to Matthew Nice, an expert on amphetamine-type stimulants with UNODC.(14) In 2013, 30% of the amphetamines seized worldwide came from Saudi Arabia, which makes it the biggest consumer of stimulants in the region, according to the UN (15).

Khat, which contains cathinone, an amphetamine-type stimulant(16), and cannabis (hashish in particular) are very common among drug users. However, according to a report by the Middle East Monitor, fenethylline (Captagon) is the preferred choice among Saudis with an average of 50 million tablets seized each year by the police (17). Per capita, Saudi Arabia probably has the highest usage in the region, despite strict cultural norms that make the exact extent of the problem unknown. The Ministry of the Interior estimates that the 50 million tablets seized annually represent only 10% of the total amount available in the market (14, 18).

Data about the health status in the country are very limited despite that Saudi Arabia has a high income. This paper used a sample from new military recruits as a proxy to describe the health status in the country. This paper sheds some light on areas that are not tackled efficiently, such as substance abuse. It lays a foundation for further investigations to be conducted in the near future especially about the effectiveness of the current policies that deals with issues such as marriage among relatives, counselling and support programs for youths with addiction problems and other governmental programs and policies.

## METHODS

### *Study design and sample*

The study design is cross-sectional, with a sample consisting of all new recruits screened between 1st July and 30th September 2014. Candidates who did not complete the screening process were excluded. The final sample was 2,518 participants who completed the screening process. The minimum sample size (*n*) was calculated based on assuming the power (1-$\beta$) is 0.8 and with $\alpha$ = 0.05, the difference between the null and alternative proportions ($\delta$) = 0.01, and the prevalence (P) is assumed 0.5 to maximize the sample size, then the minimum sample size required can be calculated as follows:

$$n = \left\{\frac{Z^2P(1-P)}{\delta^2}\right\} = 2144$$

The sampling method was systematic using the 5th file over a pre-defined period. We arrived at final number of cases of 2,631 participants. 113 files were excluded:

- 81 files were excluded due to the incompleteness of files.
- 32 files were excluded due to the unreadability of the results and the inability to obtain the original tests for these participants.

The final sample size 2,518 exceeds the minimum sample size required to detect the effect.

### *Screening process*

Al-Morooj center is located in north Riyadh in the Al-Morooj district. The center provides preventive and basic health services and also contains the screening station for new military recruits. It handles screening new recruits from throughout the country and is, therefore, an ideal place to obtain a sample that is representative of the entire country. The screening process is illustrated in Figure 1.

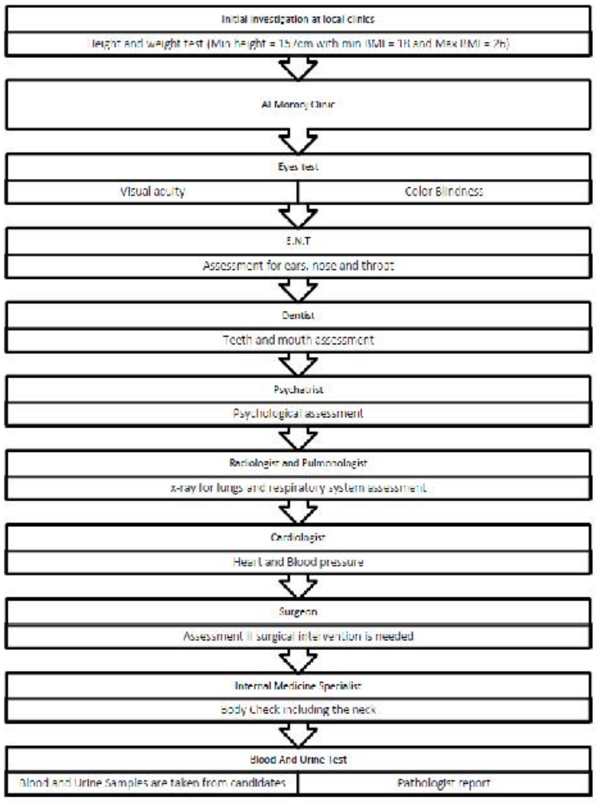


**Figure 1** Medical screening procedure for new military recruits

Participants were tested for color blindness using Ishihara test. The participants were assessed physiologically by the following process: 1- general conversation with the physiatrist, 2- IQ Test and mental abilities assessment, 3- Mood stability assessment, 4- Assessment for movement disorder. Urine and blood samples are used to detect any substance abuse. Samples are tested for three main groups of substances, cannabis, amphetamines, and opiates. In addition to substance abuse blood samples used for the following tests: Complete Blood Count (CBC), sickle cell, and serology.

### *Analysis*

Descriptive statistics were produced for the available demographic characteristics of age and region of residence. The participant's blood type was also an independent variable, and a table of frequency for blood types was produced separately. The reason for considering blood groups as independent variables is that some studies have suggested a correlation between blood groups and particular health conditions, or with the region of residence and tribe (19). The chi-squared test of association was used to test whether the medical conditions assessed in the screening process and substance abuse were associated with the independent variables (age, region of residence, and blood type) and blood groups with region of residence. Odds ratios with 95% confidence intervals are calculated for each level of the independent variable that found to be associated with medical condition significantly.

## RESULTS

### *Demographical variables*

The demographic description of the screened participants is shown in Table 1. The majority of the participants were from the first and second age categories (18–25 years old), which represent the majority of new recruits for the army. While some new recruits are from the third and fourth age categories, these categories also include recruits who want to extend or renew their military service, some of whom are screened for reallocation to new units. The older age categories also include those who want to work as civilians in the military department or military personnel who have applied to join Special Forces. The youngest screened participant was 18 years old and the oldest was 52.

**Table 1** Descriptive statistics for the demographical variables (n=2518)

| Variable | Mean ± SE | Frequency | Percent |
|---|---|---|---|
| Age | 22.06 ± 0.07 | | |
| 18 - 21 | | 1307 | 51.9 |
| 22 - 25 | | 876 | 34.8 |
| 26 - 29 | | 258 | 10.2 |
| >= 30 | | 77 | 3.1 |
| Residence Region | | | |
| Central | | 858 | 34.1 |
| Western | | 722 | 28.7 |
| Southern | | 516 | 20.5 |
| Eastern | | 299 | 11.8 |
| Northern | | 123 | 4.9 |

According to the Central Department of Statistics and Information in Saudi Arabia, the projected population for Saudi Arabia by the end of 2014 is 30,897,153. Approximately 31.7% of the population reside in the Central Region, 36.5% in the Western Region, 13.9% in the Southern Region, 15.1% in the Eastern Region, and 2.8% in the Northern Region (20). The sample distribution was similar, although the Western Region was slightly underrepresented. The distribution of blood groups is shown in Table 3. This conforms to the expected distribution found in the literature.

**Table 2** Results of blood type test of the participants

| Blood Type | Frequency | Percent | Percent previous Studies*(19, 21) |
|---|---|---|---|
| O+ | 1197 | 47.5 | 48 |
| O- | 106 | 4.2 | 4 |
| A+ | 643 | 25.5 | 24 |
| A- | 66 | 2.6 | 2 |
| B+ | 386 | 15.4 | 17 |
| B- | 24 | 1.0 | 1 |
| AB+ | 93 | 3.7 | 4 |
| AB- | 3 | 0.1 | 0.3 |

* The total adds to 100.3 due to the approximations employed in AlHamidi and Bashwari estimations.

### *Medical screening results*

The outcomes of the participants' tests and screening are shown in Tables 3 and 4. The main outcomes, except for the participant's blood type, are dichotomous (positive, negative) or (fit, unfit).

**Table 3** Results of the participants tests (n=2518)

| Test | Result | Frequency | Percent |
|---|---|---|---|
| Colour Blindness | Negative | 2437 | 96.8 |
| | Positive | 81 | 3.2 |
| Sickle Cell Test (Trait and Disease) | Negative | 2400 | 95.3 |
| | Positive | 118 | 4.7 |
| Hepatitis A | Negative | 2510 | 99.0 |
| | Positive | 26 | 1.0 |
| Hepatitis B | Negative | 2405 | 99.2 |
| | Positive | 13 | 0.5 |
| Hepatitis C | Negative | 2518 | 99.9 |
| | Positive | 4 | 0.1 |
| Drug Test | Negative | 2441 | 96.1 |
| | Positive | 77 | 3.1 |
| Lung Diseases | Negative | 2517 | >99.9 |
| | Positive | 1 | <0.1 |
| Heart Diseases | Negative | 2517 | >99.9 |
| | Positive | 1 | <0.1 |

**Table 4** Results of the participants screening (n=2518)

| Test | Result | Frequency | Percent |
|---|---|---|---|
| Right Eye Test | Fit | 2466 | 97.9 |
| | Unfit | 52 | 2.1 |
| Left Eye Test | Fit | 2475 | 98.3 |
| | Unfit | 43 | 1.7 |
| Overall Eyes Assessment | Fit | 2382 | 94.6 |
| | Unfit | 136 | 5.4 |
| Eyes' Lids | Fit | 2515 | 99.9 |
| | Unfit | 3 | 0.1 |
| Overall E.N.T Assessment | Fit | 2511 | 99.8 |
| | Unfit | 7 | 0.2 |
| Overall Dentist Assessment | Fit | 2517 | >99.9 |
| | Unfit | 1 | <0.1 |
| Overall Psychological Assessment | Fit | 2517 | >99.9 |
| | Unfit | 1 | <0.1 |
| Overall Radiology Assessment | Fit | 2517 | >99.9 |
| | Unfit | 1 | <0.1 |
| Overall Surgical Assessment | Fit | 2498 | 99.2 |
| | Unfit | 20 | 0.8 |
| Overall Internist Assessment | Fit | 2517 | >99.9 |
| | Unfit | 1 | <0.1 |

The most common problems observed among the participants were eye problems, including color blindness (5.4%), color blindness alone (3.2%), the presence of sickle cell trait or disease (4.7%), and testing positive for drugs (3.1%). Cannabis was the most common substance, with 90% of participants who tested positive being users of cannabis (hashish), and 10% of amphetamines. No opiate users were found among the screened participants

The chi-squared test of association was employed to determine whether the independent variables were associated with particular health problems. Table 5 shows statistically significant results only with odds ratios produced for each level of the independent variable using the first category as a reference category.

**Table 5** Medical conditions associated with regions of residence (n=2518)

| | | Cross Tabulation | | P-value* | OR‡ |
|---|---|---|---|---|---|
| Region of Residence | | Sickle Cell Test | | | |
| | | Negative | Positive | | |
| | Centre | 840 | 18 (2.1%) | <0.001 | Reference |
| | West | 710 | 12 (1.6%) | | 0.79 (0.38, 1.65) |
| | South | 460 | 56 (10.9%) | | 5.68 (3.30, 9.80)* |
| | East | 269 | 30 (10%) | | 5.20 (2.86, 9.49)* |
| | North | 121 | 2 (1.6%) | | 0.77 (0.18, 3.37) |
| Region of Residence | | Left-Eye test | | | |
| | | Normal | Not Normal | | |
| | Centre | 849 | 9 | <0.048 | Reference |
| | West | 712 | 10 | | 1.32 (0.54, 3.28) |
| | South | 500 | 16 | | 3.02 (1.32, 6.88)* |
| | East | 292 | 7 | | 2.26 (0.83, 6.13) |
| | North | 122 | 1 | | 0.77 (0.10, 6.15) |

* Statistically significant (p-value <0.05)
‡OR: Odds Ratio

Sickle cell trait and disease was higher in the Southern and Eastern Regions ($p < 0.001$). The odds ratios show that recruits from the Southern Region (OR=5.68) and the Eastern Region (OR=5.20) have higher odds than the Central region. A Significance was found between left-eye abnormalities and region of residence ($p = 0.048$), with the southern area showing the highest prevalence (3.2%). The Southern Region has higher odds (3.02) when compared to the Central Region.

## DISCUSSION

The demographical description of the participants in Table 1 shows that most of the participants are less than 25 years old (86.7%). This means most of the participants are from the low risk age groups. The geographical distribution of the participants is representative of the population distribution. This is an advantage of the military screening program over some other programs where the representativeness of the sample geographically is not guaranteed or cannot be achieved. Table 2 shows conformity to the blood types distribution in the country which is another advantage as the sample is selected randomly from the entire country. This result enhances the idea of the sample representativeness of the population.

The medical tests and screening results in Tables 3 and 4 show that hereditary health problems were the biggest issue among the screened candidates. These hereditary problems stem from social and cultural issues that cannot be overcome in the short term. Marriages among relatives, the closed nature of Saudi society, and other cultural factors are deep-rooted. The prevalence of sickle cell disease and trait are still high among young people. The problem is largely clustered in the Southern and Eastern Regions of the country, which has historically been the case (22). The premarital screening program for sickle cell disease is still relatively new, and it needs longer to show serious effects. Color blindness prevalence shows similar results to the prevalence rates from historical data (23).

The data show encouraging results in the prevalence of hepatitis in comparison with historical data, despite of the underestimation of diseases burden that might be inherited due to the nature of the screened sample. The results show that government action against hepatitis, such as the vaccination program introduced in 1989, and the strict screening for new foreign employees, especially from Africa and East Asia, appears to have decreased the prevalence of the disease. In 2012, the prevalence of hepatitis B was 0.72%, compared with 0.5% in the screened sample, and hepatitis C was 0.16% compared with 0.1% in the screened sample (24). The sample includes male military recruits only, which is a limitation of the screening program as the military recruits consist of males participants only. The participants were from young age groups and healthy with no apparent health problems that hindered them earlier in their lives. We are aware that the results may, therefore, underestimate the disease burden in the country. For example, the tests results show a very low prevalence of E.N.T, lung, and cardiovascular diseases. These results may due to two main reasons: 1- Physicians tend not to report treatable health issues, and the participant will be advised to seek treatment and to take another appointment for recruitment screening. This tendency among physicians is to give the participants a second chance so they will not be rejected. 2- Participants with chronic diseases or apparent health issues most likely will not apply for military recruitment as they are almost always will get rejected. Drug and substance abuse is a major problem that needs to be tackled efficiently. The results showed lower numbers of users than have been reported in other studies and reports (13-15, 17, 18, 25), but the nature of the test and the awareness of this among participants may explain these results. By searching online, we found several blogs and forums in both Arabic and English discussing methods to decrease the chances of testing positive for substances in the military test. Some advised participants to allow a ‘washout’ period of between 10 and 15 days for fenethylline users before the test. Substances such as amphetamines can stay in the hair for six months, so using hair samples instead of urine and blood could lead to more effective detection.

In conclusion, using the military recruit screening program as a proxy for investigating the health problems in the population can be a useful tool especially for hereditary diseases. However, there are limitations for that need to be addressed to maximize the benefits that can be gained from this program. Expanding the screening process to include participants from different age groups, female workers in the military and more efficient testing especially for substance abuse can yield better results. This is a useful tool to be implemented in the developing countries where population-based studies are limited.

**Competing interests**

The authors certify that they have no affiliations with or involvement in any organization or entity with any financial interest (such as honoraria; educational grants; participation in speakers' bureaus; membership, employment, consultancies, stock ownership, or other equity interest; and expert testimony or patent-licensing arrangements), or non-financial interest (such as personal or professional relationships, affiliations, knowledge or beliefs) in the subject matter or materials discussed in this manuscript.

**Ethical Approval**

The research ethics committee at Prince Sultan Military Medical City approved this research on the 24th of June 2014, No. 595.

**Acknowledgements**

The authors would like to give special thanks to Dr. Mohamedain Hashim Mohamedain for his support in the data collection at Al-Morooj, and Mr. Marwan Manajrah for his effort in the data-collection process.

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**How to cite this article:**

Osama Abdelhay *et al*., 2015. The Unfit For Military Services Among Potential New Recruits In Riyadh Ksa. *International Journal of Recent Scientific Research*. 6(9), pp. 6129-6133.

# International Journal of Recent Scientific Research

ISSN 0976-3031