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Health Reasons for Rejection among 2,518 New Military Recruits in the Kingdom of Saudi Arabia: A Cross-sectional Study

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Abstract

Background: This study examines health problems among military recruits in Saudi Arabia as part of work in the Medical Service Department of the Ministry of Defense to improve health care services and to raise health awareness among the people of the Kingdom. This study is part of wider work to investigate the health status of the Saudi Arabian population, and identifies areas where further development should be channelled.

Methods: We adopted a cross-sectional design involving 2,518 men who were new military recruits and were screened over 4 months from July to September 2014 in the Al-Morooj health centre in Riyadh, Saudi Arabia. The results of the screening process were analysed using descriptive statistics and the Chi-squared test of association.

Results: Of the screened recruits, 4.7% were carriers or affected by sickle cell disease, 3.2% suffered from colour blindness, and 0.6% tested positive for hepatitis B. 2.8% tested positive for illegal substances, with 90% of those testing positive for cannabis, and 10% for amphetamines.

Conclusions: Hereditary health problems are still a major issue in Saudi Arabia, because of the culture of marriage within families. There are several programs operated by the government to reduce the burden of hereditary health problems and to raise awareness among the population, but these will take several years to show results. Other health programs to educate the public and increase awareness are needed. Funding for the health sector needs to be increased in line with other high income countries, with medical research taking a priority. Substance abuse is an increasing problem that needs to be tackled efficiently. Support and counselling programs for young people might improve the situation.

Keywords: Health reasons; Military recruits; Saudi Arabia, Screening

Background

The Medical Service Department (MSD) at the Ministry of Defense in Saudi Arabia operates eight major hospitals and a network of primary healthcare centers and clinics that provide preventive, prenatal, emergency, and basic services. The MSD is one of the main healthcare providers in the country along with the Ministry of Health and the private sector. In 2013, the MSD provided healthcare services to 7,498,178 patients across the country.

The family and community medicine research unit at MSD has been formed recently to investigate health status in Saudi Arabia. This study is one of several the unit has undertaken with a view to improving health services locally and internationally. This work is exploratory in its nature, and aims to provide more understanding of health status, to shed some light on which areas need more investigation and improvement in the future. The research unit aims to play a pivotal role in the future of health services in Saudi Arabia by producing detailed research that will help decision-makers to improve health services and to establish a new platform for scientific work locally, regionally, and internationally.

This work investigates the reasons for rejecting new recruits to the military, especially among younger age groups. It is assumed that 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]. Bloomberg recently ranked Saudi Arabia as 16th in healthcare services efficiency, based on life expectancy, healthcare expenditure as a proportion of gross domestic product (GDP), and healthcare costs per capita [3].

Despite these efforts, the healthcare system remains stretched [4]. World Health Organization (WHO) statistics indicate that Saudi Arabia allocated approximately 3.1% of GDP to healthcare in 2014, which is well below the 12.4% average of the group of high-income countries (G20) to which Saudi Arabia belongs. Saudi Arabia's 9.4 physicians per 10,000 populations is also below the G20 average of 27.1, and it has only 22 beds per 10,000 population, compared with the G20 average of 56 per 10,000 [5]. The United Nations forecasts that the population will reach around 35.4 million by 2025, which will put more pressure on the health system [6]. Another challenge is the on-going change of disease patterns from communicable to non-

communicable diseases due to lifestyle changes. This has increased the prevalence of chronic diseases such as hypertension, diabetes, cardiovascular disease, and cancer [7].

In addition to these, other persistent health challenges remain, such as obesity, sickle cell disease, and drug addiction [8,9]. These health challenges stem from social and cultural issues in the country and region [10,11]. These include marriage among relatives (extended family or the same tribe). Marriage to a non-Saudi is heavily regulated despite the large number of foreigners who live in Saudi Arabia (30.6% of the population are non-Saudi) [12]. This increases the chance of hereditary diseases such as sickle cell disease and colour blindness [13,14]. 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 reduced the number of at-risk marriages, which may considerably reduce the genetic disease burden in Saudi Arabia in the next decades" [14].

Another program, also introduced in 2005, provided premarital screening for drug addiction. This was initiated because of widespread drug addiction in Saudi Arabia, especially among young people [15,16]. However, a report from January 2014 [15] suggested that officials were concerned that it had not been successful. 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 [17] 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 [15].

Drug addiction is becoming a very serious problem in the Middle East, especially in Saudi Arabia. The World Drug Report of 2014 by the UN Office on Drugs and Crime (UNODC) showed that Saudi Arabia has seized large quantities of amphetamines over the last 5 years [18] (Figure 1).

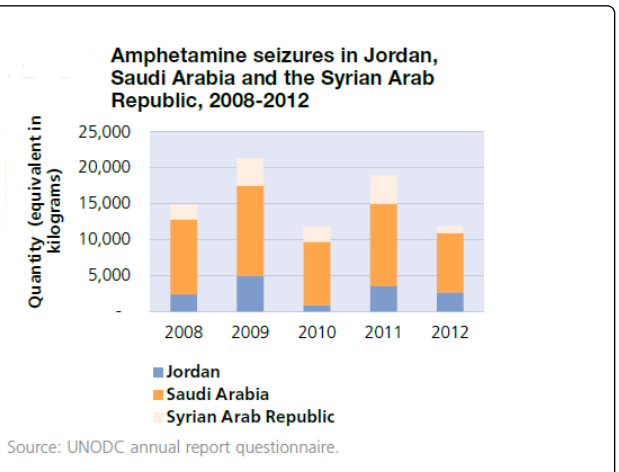

Figure 1: Amphetamine seizures in Jordan, Saudi Arabia and The Syrian Arab Republic, 2008-2012 (Source: UNODC World Drug Report 2014) [18].

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. In an interview in 2010, Nice commented to CNN on the amount of amphetamine seized in Saudi Arabia that year, "I can't emphasize enough the size of this. Fifteen metric tons is absolutely huge, it's absolutely phenomenal. We are really struggling because the information base is so limited, it's definitely just the tip of the iceberg" [19]. 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 [18].

Khat, which contains cathinone, an amphetamine-type stimulant [20], 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 [21]. 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 [19,22].

Despite the government prioritizing health services, the sector is still under-funded in comparison with other high income countries. Even with more funds allocated to the health sector, the funding is a lower percentage of GDP than in previous years, as shown in Table 1. Funds allocated to medical research are very limited, with very little research produced in the country, providing very limited information. Methods such as evidence-based practice among Saudi decision-makers and practitioners need to be promoted, with research playing a central role in the future.

Year	Health expenditure as percentage of GDP
2005	3.55
2006	3.73
2007	3.75
2008	3.08
2009	4.10
2010	3.01
2011	3.69
2012	3.21
2013	3.10

Table 1: Health expenditure in Saudi Arabia as percentage of the GDP.

Data about the health status in the country are very limited despite that Saudi Arabia has high income and increasing fund on health services. 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 or ignored completely by the policy makers, such as substance abuse. It lays a foundation for further investigations to be conducted as soon as possible 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 failed the height and weight screening were excluded as they did not complete medical screening, and no information on them was provided to the research team. The final sample was 2,518 participants who completed the screening process. The minimum sample size (n) was calculated based on the difference between the most recent published results for the prevalence of sickle cell disease and trait with an assumed decrease of 1% in the prevalence. The newest data published on the results of sickle cell disease and trait estimated the prevalence to be approximately 4.5% [23]. Assuming the power (1-β) is 0.8 and with α=0.05 and the difference between the null and alternative proportions (δ)=0.01, then the minimum sample size (n) required can be calculated as follows:

p0=4.46%, p1= 3.46%, δ=1%, 1-β=0.8 and α=0.05

$$n = \left\{ \frac{z1-\alpha\sqrt{po(1-p0)} - z1-\beta\sqrt{p1(1-p1)}}{\delta} \right\} = 1585 \text{Screening process}$$

Al-Morooj center is located in north Riyadh in the Al-Morooj district. The centre provides preventive and basic health services, and also contains the screening station for new military recruits. It is responsible for screening new recruits from throughout the country and is therefore an ideal place to obtain a sample which is representative of the entire country. The screening process is illustrated in Figure 2.

Participants were tested for colour 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 region of residence and tribe [24].

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. Medical conditions with small number of cases i.e. less than 5, are not included in the process. Odds ratios with 95% confidence intervals are calculated for each level of the independent variable that found to be associated with medical condition significantly.

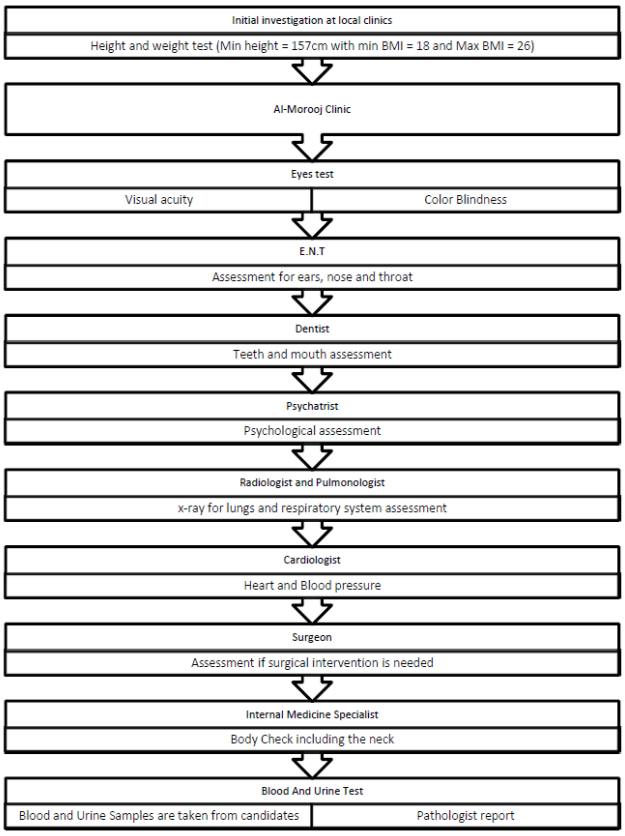

Figure 2: Medical screening procedure for new military recruits.

The nature of the data and the confidentiality of the military records did not allow use of more advanced statistical modelling techniques. We were, for example, unable to obtain any information about height and weight of the participants or their socioeconomic status.

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.

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 [25]. The sample distribution was similar, although the Western Region was slightly underrepresented.

Variable	Mean ± SE	Frequency	Percentage
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	11.9
Northern		123	4.9

Table 2: Descriptive statistics for the demographical variables (n=2518)

The distribution of blood groups is shown in Table 2. This conforms to the expected distribution found in the literature.

Blood Type	Frequency	Percentage	Percentage previous Studies*[24,26]
O+	1197	47.5	48
O-	106	4.2	4
A+	643	25.5	24
A-	66	2.6	2
B+	386	15.3	17
B-	24	1.0	1
AB+	93	3.7	4
AB-	3	0.1	0.3

Table 3: Results of blood type test of the participants.

Medical screening results

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

Test	Result	Frequency	Percentage
Right Eye Test	Fit	2466	97.9
	Unfit	52	2.1
Left Eye Test	Fit	2475	98.3
	Unfit	43	1.7
Colour Blindness	Negative	2437	96.8
	Positive	81	3.2
Eyes' Lids	Fit	2516	99.9
	Unfit	2	0.1
Overall Eyes Assessment	Fit	2382	94.6
	Unfit	136	5.4
Overall E.N.T Assessment	Fit	2518	100
	Unfit	0	0
Overall Dentist Assessment	Fit	2517	100
	Unfit	1	≈ 0
Overall Psychological Assessment	Fit	2517	100
	Unfit	1	≈ 0
Overall Radiology Assessment	Fit	2517	100
	Unfit	1	≈ 0
Overall Surgical Assessment	Fit	2501	99.3
	Unfit	17	0.7
Lung Diseases	Negative	2517	100
	Positive	1	≈ 0
Heart Diseases	Negative	2517	100
	Positive	1	≈ 0
Overall Internist Assessment	Fit	2517	100
	Unfit	1	≈ 0
Sickle Cell Test (Trait and Disease)	Negative	2400	95.3
	Positive	118	4.7
Hepatitis A	Negative	2518	100
	Positive	0	0
Hepatitis B	Negative	2502	99.4
	Positive	16	0.6
Hepatitis C	Negative	2518	100
	Positive	0	0
Hepatitis D	Negative	2518	100
	Positive	0	0
Hepatitis E	Negative	2518	100
	Positive	0	0
Drug Test	Negative	2448	97.2
	Positive	70	2.8

Table 4: Results of the participants screening process.

The most common problems observed among the participants were eye problems, including color blindness (5.4%), color blindness

(3.2%), the presence of sickle cell trait or disease (4.7%), and testing positive for drugs (2.8%). 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 4 shows statistically significant results only.

	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					

Table 5: Medical conditions associated with regions of residence.

Sickle cell trait and disease was higher in the Southern and Eastern Regions (p<0.001). 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%) (Table 5).

Discussion

The sample includes male military recruits only, which is a limitation that we aim to overcome in future projects. The participants were generally healthy, or 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, no cases for E.N.T, Hepatitis A, C, D, or E were reported among screened participants. 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. 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. The research unit in MSD is intensifying efforts to establish more comprehensive databases of the patients in the hospitals and clinics operated by the MSD across the country. This will provide a clearer picture of the health situation in the country, and allow improved study designs.

The screening results 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 [23]. The premarital screening program for sickle cell disease is still relatively new, and it needs longer to show serious effects. Colour blindness prevalence shows similar results to the prevalence rates from historical data [27].

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 as discussed. 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. Figure 3 shows the prevalence of hepatitis B and C in Saudi Arabia between 1988, the year before the vaccination program was introduced, and 2012 [28-31]. In 2012, the prevalence of hepatitis B was 0.72%, compared with 0.6% in the screened sample, and hepatitis C was 0.16% compared with 0% (no cases recorded) in the screened sample.

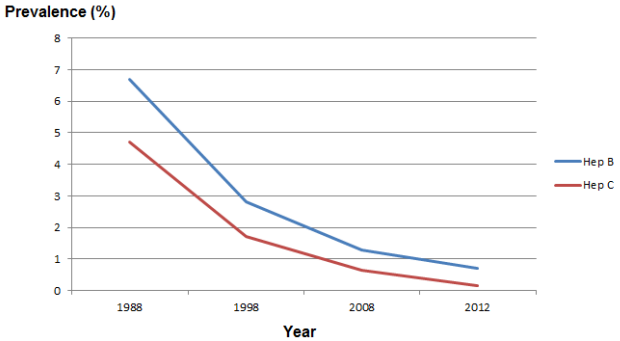

Figure 3: Prevalence of Hepatitis B and C in Saudi Arabia between 1988 (before the vaccination program in 1989) and 2012.

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 [16,18,19,21,22,32], 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 6 months, so using hair samples instead of urine and blood could lead to more effective detection.

The ministry of health issued a press release in 2013 to show that the levels of major depression among Saudis, especially women and young people, were very worrying, with 7% of the population suffering [17]. This level of depression may lead to higher levels of substance abuse in the future. Counselling and support programs for young people may help to reduce the burden of substance abuse.

In conclusion, the health system in the Saudi Arabia is stretched, and is expected to be under more pressure in the future due to the reasons discussed earlier. More fund need to be allocated to the health sector and medical research. Programs aimed to raise awareness and to provide support for the youths are necessity.

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.

Authors' Contributions

Dr. Hesham Alkhashan is the principle investigator.

Dr. Osama Abdelhay was responsible for data-collection, data-management and analysis.

The rest of the team contributed to the screening process and providing literature to the principle and corresponding authors.

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