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Health related quality of life among military personnel: what socio-demographic factors are important?

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Abstract Health related quality of life (HRQOL) is an important indicator of health status. Knowledge about factors related to HRQOL among military personnel may assist in designing programs to maximize their fitness and readiness for action when called upon. The aim of present study was to assess the HRQOL of military personnel in Iran, compare it to that of other populations in Iran and the U.S., and identify socio-demographic variables related to HRQOL in Iranian military personnel. Using a cross-

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sectional design, 502 male military personnel were recruited across the country. The SF-36 health survey was used to assess health status and demographic characteristics. Student *t*-test and multiple regression analysis were used to examine the associations between socio-demographic variables and HRQOL. Subscale scores on the SF-36 were also compared to those in the general population. The mean age of participants was 33.0 (SD, 6.8) with an average working experience of 13.5 (SD, 6.2) years. Physical functioning was higher than other components of HRQOL. The mean scores for physical and mental subscale scores were 46.1 (8.6) and 46.6 (9.7), respectively. Significant differences were found on subscale scores of HRQOL between participants and the general population ($p<0.01$). Variables such as age, marital status, disease history, and health status were associated with several components of HRQOL. These findings should assist in the development of programs to enhance HRQOL among military personnel, and underscore the need for further research to better understand the components of health status in soldiers and other military personnel.

Keywords Military · Health related quality of life · Health status · Socio-demographic factors

Introduction

Health has been defined as "a complete state of physical, mental and social well being and not merely the absence of disease or infirmity"(WHO 1946). Although, the inflexibility and utopian approach of this definition has been criticized, recent definitions of health have also emphasized the multi-dimensional nature of this term. For example, according to Bircher, health is a dynamic situation that is determined by physical and mental ability (Bircher 2005). However, measuring this concept has proven to be elusive.

Health related quality of life (HRQOL) is a widely accepted measure of overall health from a multi-dimensional perspective. HRQOL is a strong predictor of both morbidity and mortality that stresses healthy living (Crosby et al. 2003). Consequently, national centers for disease control and prevention examine HRQOL on the individual and community level, including physical and mental health perceptions as well as social resources, conditions and policies that influence population health (CDC 2011). Identifying factors related to HRQOL is essential for maximizing public health (Brown et al. 2013).

Assessing HRQOL can help with the recognition of preventable health conditions and can serve as a monitoring tool for determining whether national or global health goals are being achieved (Health-Related Quality of Life and Well-Being 2010). This is suitable for guiding interventions to enhance the health status of different groups and populations (Crosby et al. 2003). HRQOL assessment can also assist decision-makers in establishing health policies and plans (Oliva-Moreno et al. 2010). HRQOL is known to be a strong predictor of health outcomes and greater life expectancy (Brown et al. 2013; Manuel and Schultz 2004).

To date, many studies have sought to better understand HRQOL in a variety of situations and conditions. The focus has been on identifying contributors to HRQOL among people affected by chronic disease. However, many factors related to

maximizing HRQOL remain unknown. Personal and environmental factors may influence health outcomes and identifying them has been a key strategy for promoting public health by designing interventions directed at those predictors(Lerdal et al. 2011; Jia et al. 2009). Psychological, social and demographic factors have been recognized as influencing HRQOL (Wan et al. 1999; Moradkhani et al. 2013).

Socio-demographic factors are among variables whose effect on HRQOL may be underestimated. In order to fully understand factors influencing HRQOL in different populations, socio-demographic information is needed (Zhao et al. 2011). These factors may have effects on physical, mental and social components of health (Mbawalla et al. 2010). Many studies have found that demographic and social variables play a considerable role in predicting health outcomes. For example, age and gender differences, education level, and economic status are known to exert major effects on HRQOL (Hou et al. 2004; Ishida et al. 2011; Cassedy et al. 2013). Few studies, however, have assessed the contributions of such variables in special populations such as military personnel.

Those in military service have unique experiences and perceptions regarding their health. Because of they must meet certain fitness criteria, they are usually considered healthier than the general population (Haddock et al. 2006). Screening tests for qualifying military personnel may exclude those who are less physically and mentally fit at enrollment stage (Chai et al. 2009). However, health status may change as a result of the working conditions of military personnel, and members of the military may deal with different health problems than those encountered in the general population. Several health issues and even life-threatening conditions such as health hazards during deployment and psychological distress during combat may jeopardize health (Mulligan et al. 2010; Buckman et al. 2011). Studies demonstrate that musculoskeletal disorders and injuries as well as mental health problems such as depression, post traumatic stress disorder, suicide, substance abuse and anxiety are widely prevalent among military personnel (Glad et al. 2012; Jacobson et al. 2012; LeardMann et al. 2013). Further, HRQOL in such populations may vary depending on socio-demographic characteristics (Barrett et al. 2003). In the present study, we sought to determine HRQOL among military personnel in Iran, comparing it to those in the general population of Iran and to general and military populations in the US. We also identified socio-demographic factors related to HRQOL in this Iranian population of military personnel.

Materials and methods

Design and sample

This cross-sectional study involved 502 participants recruited from October to December of 2012, a convenience sample identified from 10 military centers around the country of Iran. The sample size was calculated using Cohen's tables for descriptive surveys (α=0.05 two-tailed, power=90 %, effect size=0.2). Inclusion criteria were being male sex, and having at least 1 year of military service. Participation was voluntary, and this study was approved by the ethical committee of the department of Iranian military research.

Measures

Short form-36 health survey (SF-36)

The HRQOL was assessed using the Persian version of SF-36 (Montazeri et al. 2005). This scale assesses eight domains: physical activity (PF), role limitations because of physical difficulties (RP), bodily pain (BP), general health (GH), vitality (VT), social function (SF), role limitations because of emotional difficulties (RE), and mental health (MH). The first four subscales are related to physical health and the remaining four to mental health. Two summary components, physical component summary (PCS) and mental health summary (MCS) are computed using a standard procedure. These summaries are presented as t-scores with a mean of 50 and a standard deviation of 10. The algorithm used for computing the scores is based on the U.S. general population. All subscales scores range from 0 to 100 and higher scores indicate better function (Ware et al. 1995).

Self-report health status and demographics

The self-report health status is a global indicator of how a person perceives his/her health status, and was rated in this study as good, fair or poor. The validity of the scale in variety of populations has been demonstrated, and allows for comparison of health status across communities (Idler and Benyamini 1997). Demographic information such as age, marital status, educational level, number of children, duration of work, military rank, history of chronic diseases, and income status were also collected.

Brief description of comparison groups

The primary comparison group involved 1799 US military service personnel who were assessed from September 1995 to May 1996. They were identified using a stratified random sampling method. The majority were males (89 %), married (71 %) and with more than 25 years of age (53 %). Data related to the general Iranian population was obtained from a population-based study that identified subjects using a stratified multi-stage sampling of the population in Tehran, Iran. The number of participants in the Iranian sample was 4163. The mean age was 35.1 years, 52 % of participants were female, and average education was 10 (SD, 4.5) years. The last comparison group (US general population) was a population-based sample of 6742 persons who participated in the 1998 National Family Opinion Research Study. The mean age of participants was 50.7 years, 59.6 % were females, and 79.8 % had at least 12 years of education.

Data analysis

Student *t*-test was used to assess the differences on the SF-36 subscales between the study sample and general population. Using purposeful selection of variables as described by Hosmer and Lemeshow (Hosmer and Lemeshow 1999), relationships between independent variables and SF-36 subscales were examined. Pearson

correlation test and student *t*-test were used initially for determining bivariate correlates. Variables associated with SF-subscale scores at a $p<0.25$ were then included in the regression model. Normality of data and the homoscedasticity were evaluated using kolmogorov-smirnov and Leven tests (Ho 2006). The significance level was set at a $p<0.05$, two-tailed. The SPSS version 17 for windows (SPSS, Chicago, Illinois) was used for all statistical analyses.

Results

The mean age of participants was 33.0 (SD, 6.8) and majority were married (84.7 %). Nearly 60 % of respondents had a university (graduate or post-graduate) degree. The mean years of experience in military service was 13.5 (SD, 6.2) and ranged from 1 to 33 years. Income level was rated as moderate by 45 % of participants. Only 9.8 % indicated a history of chronic diseases and 86 % reported their current health status as good (highest level possible). Sample characteristics are described in Table 1.

Table 2 presents the average of scores on the SF-36 subscales for the present sample of military personnel and compares them with those in the general population. The physical functioning subscale mean score of 74.2 (SD, 24.9) was higher score than other domains. The mean PCS and MCS scores were 46.1 (SD, 8.6) and 46.6(SD, 9.7), respectively. With the exception of general health, role emotional, mental health and the MCS, significant differences were found between the other subscale scores in our military sample compared to those in the general population ($P<0.01$).

Table 3 indicates bivariate relationships between predictor variables and all HRQOL subscale scores. Unmarried participants scored significant lower on the PF, VT, RE, MH, and MCS domains compared to those were married. Number of children was inversely correlated with GH and positively correlated with RE. The participants with a university degree scored higher on the PF domain than did those without a university education. The duration of work (experience) was negatively correlated with GH. Participants who had a sufficient income scored higher on the PF domain than did those with moderate or insufficient levels of income. Military personnel with a history of chronic diseases had lower scores on many dimensions of the HRQOL compared to other personnel, except on the domains of PF, SF, RE and MCS. The people that reported their health status as good scored higher on all dimensions of HRQOL.

The results of regression analyses are presented in Table 4., Marriage status was significantly related to PF, VT, and MH domains in a positive direction. Disease history predicted the BP, GH, and PCS domains negatively. Self-rated health status was a strong predictor of all SF-36 subscales.

A comparison of HRQOL dimensions for the study sample with those of US military personnel (Voelker et al. 2002), the Iranian general population (Montazeri et al. 2005), and the US general population is illustrated in Fig. 1. As depicted, U.S. military personnel were reported higher HRQOL than U.S. general populations, while the situation among Iranians military staff compared to their general counterpart population is relatively reverse.

Table 1 Characteristics of study sample (N=502) and comparison group (N=1799)

Variables	Iranian military personnel *N* (%)	US military personnel *N* (%)
Age (year)		
<25	78 (15.5)	845 (47)
25-35	286 (57.0)	>25: 954 (53)
>35	138 (27.5)	
Marital status		
Single	77 (15.3)	311 (17)
Married	425 (84.7)	1278 (71), other: 209 (12)
Number of children		NE
0	212 (42.2)	-
1-2	225 (44.8)	-
3-4	65 (13.0)	-
Education level		
High school	202 (40.2)	704 (39)
Graduate	226 (45.0)	710 (40)
Post graduate	74 (14.8)	385 (21)
Experience (year)		NE
Lower than10	125 (24.9)	-
10-20	316 (62.9)	-
Higher than 20	61 (12.2)	-
Income		NE
Insufficient	164 (32.7)	-
Moderate	226 (45.0)	-
Sufficient	112 (22.3)	-
Chronic disease		NE
Yes	49 (9.8)	-
No	453 (90.2)	-
Current health status		NE
Good	432 (86.0)	-
Moderate	61 (12.2)	-
Poor	9 (1.8)	-

Data for comparison group is from Voelker et al. (2002); Numbers in each variable of comparison group may be not matched because of measurement in different times; *NE* data not existed

Discussion

This study assessed the HRQOL among Iranian military service personnel and identified demographic correlates of HRQOL domains. In addition, comparisons were made between our Iranian military personnel sample and US military personnel and two general populations from Iran and US. Significant differences were also found between this military personnel and the general population. Strong relationships were found between the age, marital status, history of disease and health status, and several

Table 2 Comparison of HRQOL's dimensions in the military personnel and general Iranian population

Subscales of SF-36	Mean (SD) military personnel (N=502)	Mean (SD) general population (N=4163)	t-value	p-value
Physical functioning (PF)	74.2 (24.9)	85.3 (20.8)	11.027	<0.0001
Role physical (RP)	62.5 (35.4)	70.0 (38.0)	4. 207	<0.0001
Bodily pain (BP)	66.1 (24.7)	79.4 (25.1)	11.234	<0.0001
General health (GH)	66.9 (16.8)	67.5 (20.4)	0.633	0.526
Vitality (VT)	63.4 (17.0)	65.8 (17.3)	2.941	0.003
Social functioning (SF)	69.9 (22.0)	76.0 (24.4)	5.345	<0.0001
Role emotional (RE)	65.2 (38.8)	65.6 (41.4)	0.205	0.836
Mental health (MH)	67.3 (17.9)	67.0 (18.0)	0.353	0.724
PCS[a]	46.1 (8.6)	51.4 (10.0)	11.378	<0.0001
MCS[a]	46.6 (9.7)	46.1 (10.0)	1.061	0.288

[a] Data for these indices have not been reported in the original study of general population (Montazeri etal.) and were calculated using available data of SF-36 subscales

components of HRQOL. Moreover, people were married and those with no disease history had higher HRQOL than other participants significantly. We also found a different state of HRQOL for Iranian military personnel compared to US military personnel and those in the general population in both Iran and the US.

Few studies have evaluated HRQOL domains among military personnel and to our best knowledge this is first study that compared components of HRQOL between military and general populations using the SF-36 in a developing country. Barrett et al. assessed the HRQOL among US military personnel, finding that activity limitation, pain and fatigue are the major complaints of personnel regarding their quality of life. However, they reported no significant differences between these troops and non-military subjects (Barrett et al. 2003). Our study in line with this survey found reduced scores in military personnel with regard to physical functioning, role limitations due to physical problems and bodily pain compared to the general population. Unfortunately, Barrett et al. used only five questions from the quality of life module that can be compared with the present survey (i.e., pain, depression, anxiety, sleep and feeling healthfulness). Contrary to our results, in another study on U.S. military personnel using the SF-36 (as depicted in the Fig. 1), all components of the HRQOL had greater value than counterparts in the general U.S. population (Voelker et al. 2002). This may be related to cultural and social differences in the two countries, as well as the fact that healthier people are likely to be selected for military service. Another reason may be the difference in gender composition of these two studies. We did not include female participants whereas in the study of Voelker et al. (2002) nearly 12 % of respondents were female. Although many studies have reported lower HRQOL in women than in men, Barrett et al. (2003) reported significantly better HRQOL among active duty females in military service compared to males.

Several other studies have assessed musculoskeletal issues among military personnel (Glad et al. 2012; Hauret et al. 2010). According to Yancosec et al., participation in strenuous physical exercises, transporting heavy loads, standing for long periods, and

Table 3 Associations of the sample characteristics to HRQOL dimensions [correlation (r) or mean±standard deviation] (N=502)

Variables	PF	RP	BP	GH	VT	SF	RE	MH	PCS	MCS
Age (year)	0.080	0.052	-0.074	-0.104*	0.012	0.016	0.133**	0.012	-0.027	0.064
Marriage										
Single	66.1±27.9**	55.8±33.6	65.6±21.8	66.2±15.9	59.5±16.0*	67.0±20.2	52.8±38.7**	63.4±18.9*	44.9±7.7	44.2±8.8*
Married	75.6±24.1	63.7±35.7	66.2±25.2	67.1±16.9	64.1±17.1	70.4±22.3	67.5±38.5	68.0±17.7	46.3±8.7	47.0±9.7*
Children No.	0.12	-0.002	-0.066	-0.110*	-0.021	-0.028	0.102*	-0.013	-0.070	0.041
Education										
High school	70.8±26.0*	60.1±35.1	65.4±24.1	68.1±16.2	62.8±16.1	70.2±21.8	64.8±37.7	67.5±17.4	45.3±8.41	47.0±9.1
Graduate & higher	76.4 V23.9	64.1±35.6	66.6±25.2	66.1±17.1	63.8±17.5	69.7±22.1	65.5±39.6	67.2±18.3	46.7±8.7	46.3±10.0
Experience(year)	-0.017	-0.007	-0.064	-0.094*	-0.046	0.004	0.077	-0.020	-0.076	0.036
Income										
Sufficient	75.5±23.5	64.9±33.9	65.5±24.1	66.5±16.6	62.0±15.7	69.4±21.0	72.9±34.2*	67.9±17.6	46.0±8.8	47.4±9.0
Moderate or insuf.	73.8±25.3	61.8±35.9	66.3±24.9	67.0±16.8	63.8±17.3	70.0±22.3	63.0±39.9	67.1±18.1	46.2±8.5	46.4±9.8
Disease history										
Yes	70.2±26.2	53.0±38.7*	54.1±25.7**	55.2±21.1**	58.0±16.5*	65.8±23.2	65.3±41.3	61.5±19.2*	42.0±10.5**	45.3±10.4
No	74.6±24.8	63.5±35.0	67.4±24.3	68.2±15.7	64.0±16.9	70.3±21.8	65.2±38.6	67.9±17.7	46.6±8.2	46.7±9.6
Health status										
Good	75.6±24.6**	64.2±34.8**	68.6±23.7**	70.2±14.4**	64.9±16.5**	71.8±21.3**	67.4±37.7**	69.2±17.5**	47.0±7.8**	47.5±9.3**
Moderate or poor	65.1±24.9	51.7±37.4	50.7±25.6	46.7±16.5	54.0±17.1	58.0±22.4	51.9±43.0	55.5±16.1	40.9±10.8	41.3±10.0

PF physical function; *RP* role limitations due to physical difficulties, *BP* bodily pain, *GH* general health; *VT* vitality; *SF* social function; *RE* role limitations due to emotional difficulties; *MH* mental health; *PCS* physical component summary; *MCS* mental health summary

*Significant at the 0.05 level; **Significant at the 0.01 level

Table 4 Standardized coefficients (β) of the study variables on the HRQOL dimensions derived from multiple regression analyses

Variables	PF	RP	BP	GH	VT	SF	RE	MH	PCS	MCS
Age (year)	0.048	0.045	-0.016	0.017	NS	NS	0.095	NS	NS	0.066
Marriage	0.106*	NS	NS	NS	0.112*	0.067	0.089	0.109*	0.082	0.086
Children No.	NS	NS	-0.008	0.001	NS	NS	0.050	NS	-0.027	NS
Education	0.076	0.038	NS	-0.036	NS	NS	NS	NS	0.083	NS
Experience(year)	NS	NS	-0.023	-0.039	NS	NS	-0.035	NS	-0.062	NS
Income	NS	NS	NS	NS	NS	NS	0.078	NS	NS	NS
Disease history	-0.040	-0.075	-0.103*	-0.115**	-0.063	-0.016	NS	-0.055	-0.111*	NS
Health status	0.151**	0.115*	0.223**	0.456**	0.214**	0.217**	0.161**	0.257**	0.212**	0.237**
Adjusted R^2	0.041**	0.020*	0.065**	0.242**	0.060**	0.046**	0.046**	0.078**	0.076**	0.060**

*Significant at the 0.05 level; **Significant at the 0.01 level; *NS* non-significant in bivariate analysis ($P>0.25$)

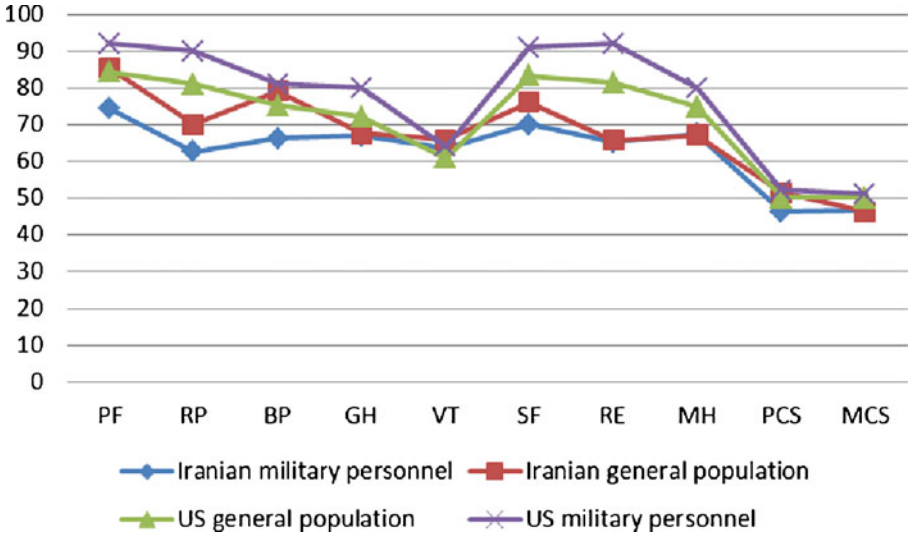

Fig. 1 HRQOL's dimensions in military personnel and general population from Iran and US. Data related to US is from a study that was conducted by Voelker et al. 2002. Data related to Iraninan general population is from a study that was conducted by Montazeri et al. 2005

long marches increase the prevalence of musculoskeletal injuries in military populations (Yancosek et al. 2012). Another study among military aircrew demonstrated that more than half of participants suffered from some kind of spinal, upper or lower limb disability (Taneja and Pinto 2005). Likewise, an epidemiological study of Norwegian conscripts found that military training was associated with an increase in physical injuries such as low back pain, knee injuries, and ligament or joint sprains (Heir and Glomsaker 1996). The studies above confirm the findings of ours regarding to lower physical health of our military sample compared to the general population.

Vitality and social functioning were also significantly lower in our military personnel compared to the general population. However, the overall status of mental health as indicated by the MCS was not considerably different. Studies on the mental health of military personnel indicate that mental problems such as depression, anxiety, and post-traumatic stress disorder are more prevalent than in the general population (Jacobson et al. 2012; Harbertson et al. 2013). A study by Lane et al. on deployed military personnel revealed that work stress and depression were more common in such individuals than in non-deployed military personnel (Lane et al. 2012). A literature review of research on military personnel also found that poor mental health was related to greater social isolation and leaving the military, which could further worsen mental health and increase the risk of developing stress related disorders in the future (Walker 2010). Most of these studies, however, were performed on deployed troops and active duty personnel who may be experiencing combat-related conditions. Our findings among a general group of personnel who may not have had previous experience with deployment or combat may be different from those studies. Iran has experienced a long period of peace and has not participated in regional wars for many years.

Although, several studies have emphasized the importance of demographics in HRQOL, only a few investigations have examined the role of such factors in the

quality of life of military personnel. For example, Barrett et al. investigated the impact of sex and age in the HRQOL of their sample of active duty U.S. military personnel, finding no significant difference between men and women in terms of HRQOL. However, demographic factors such as age, education, income and smoking status were significant predictors of HRQOL (Barrett et al. 2003). In a similar study on Norwegian navy personnel, after adjustments for age, gender, job in the navy, and education level, HRQOL among these military personnel was comparable to that in the general population (Mageroy et al. 2007). This suggests that demographic factors may have moderating effect on HRQOL and should be the subject of future research. The impact of demographic factors on the HRQOL in non-military populations is also well documented (Pakpour et al. 2010; Zhao et al. 2011; Mbawalla et al. 2010).

Among the several relationships we found between demographics and HRQOL, some are particularly important. The association between marriage status and HRQOL components indicates that married subjects reported higher quality of life than those were single. This finding has also been reported by several other researchers (Sazlina et al. 2012; Taylor et al. 2011). Studies on single people have consistently found that they have worse health than married people and even life expectancy may be reduced (Kalwij et al. 2013; Lindstrom 2009). Perhaps, the main factor contributing to a better health status and longer lifespan among married individuals is the social and family support that they receive from their spouse and children. The results of our study in military personnel confirm this finding that mental health of married personnel was considerably higher than non-married participants. This also supported by the positive relationship found between role limitations due to emotional difficulties and the number of children (i.e., fewer role limitations among those with more children at home).

Despite many previous studies have demonstrated the impact of education and economic status on quality of life (Ishida et al. 2011; Cassedy et al. 2013; Barrett et al. 2003), we did not find much of an association between these variables and HRQOL. Although education may be an important factor in HRQOL, our sample was more uniform in terms of their education, so this may have accounted for the lack of relationship. Likewise, we asked the participants to rate their income status according to only three levels (insufficient, fair, and sufficient). This way of measuring income may be less sensitive than inquiring about actual income. Furthermore, our participants were all working in a military system and differences in income may not be great.

Not surprising is our finding that disease history and health status were the strongest predictors of quality of life, since any morbidity has a direct impact on HRQOL and can affect both physical and mental health (Vathesatogkit et al. 2012). However, the number of military personnel in our sample who reported a chronic disease history was low. Given the significance of this finding, however, more research is needed to better understand how various disease processes impact quality of life in military personnel. It is well known that HRQOL is not the same concept of health status, but it can represent a substantial part of it (McMillan 2006). The findings from this study also show that while these concepts (actual health status and HRQOL) may be related they are not identical.

The present study has several limitations that should be considered when interpreting the findings. First, this was a cross-sectional study and the associations found here do not indicate causality. These results, however, may provide preliminary guidance on how to design health interventions in military personnel that could

establish causal relationships. Second, this was a convenience sample and the findings may not be generalizable to all Iranian military personnel. However, this was a fairly large sample that included military personnel from 10 regions around the country, and we had minimal non-participation from those who were approached, which argues for the representativeness of the sample. Another limitation is that we included only males. Women today make up a large portion of military personnel in many countries. However, because they represent only a small minority among Iranian military personnel, women were excluded. Finally, a number of other socio-demographic factors such as ethnicity, race, and social class may influence HRQOL among such populations. These were not measured in this study due to confidentiality and privacy issues in Iran.

Conclusion

In summary, our findings indicate that the HRQOL in an Iranian military population is different in several areas compared to the general population. Lower quality of life in military personnel found here indicates a need for more research to understand potential reasons. People enlisted into the military are selected for their optimal health status, so it is important to identify factors that may negatively impact their quality of life (and ultimately diminish their health status and readiness for action when needed). Socio-demographic factors can affect HRQOL, and recognizing these factors will assist in plans for improving the health of military populations. Further research, particularly prospective studies that include women military personnel, is needed to determine the causal nature of such relationships and design interventions to address modifiable factors.

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