Prevalence of non-specific chronic low-back pain and risk factors among male soldiers in Saudi Arabia

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Background: Non-specific chronic low back pain (NSCLBP) is the most common musculoskeletal disorder affecting health and work among the military population. NSCLBP is a complex disorder with several risk factors contributing to its occurrence. Therefore, the objective of our study was to estimate the prevalence and contribution of risk factors towards NSCLBP among male soldiers in Saudi Arabia. **Methods:** A cross-sectional study was conducted from March 2020 to January 2021 among the military personnel at Hafar Al-Batin military base, Saudi Arabia. The entire population (n=62,000) at the military base were invited to participate in the study. The participants were invited to participate in the study either through direct referral from in-patient and out-patient departments of the military hospital or by invitation through pamphlets, email, and advertisement across the offices and residential areas. Soldiers reporting lower back pain for at least 12 weeks were screened for inclusion criteria at the physical therapy department of the military hospital. Inclusion criteria included pain or discomfort originating from the lower back without any known spinal diseases. Participants with a systemic inflammatory disorder, trauma, neurological symptoms, and recent spinal surgery were excluded. All eligible participants were assessed for demographic variables and risk factors and complete the Rolland Morris Disability Questionnaire and WHO-Five Well-Being Index. **Results**: This study identified a 46.3% prevalence of pain originating from the spine with a 2.7 % prevalence of NSCLBP. Spearman's rho correlation between the severity of disability due to NSCLBP was strongly associated with age (r_s=0.834, p<0.01), quality of sleep (r_s=0.790, p<0.01), body mass

index (BMI) (r_s=0.617, p<0.01), smoking (r_s=0.520, p<0.01), co-morbidity (r_s=0.357, p<0.01), but not with the level of physical activity (r_s=0.044, p=0.07). **Conclusion:** There was a high prevalence of pain originating from the spine among male Saudi soldiers with a relatively low prevalence of NSCLBP. However, the prevalence of disability due to NSCLBP was strongly associated with age, sleep quality, BMI, smoking habit, and co-morbidity.

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24 **Abstract**

25 **Background:** Non-specific chronic low back pain (NSCLBP) is the most common

26 musculoskeletal disorder affecting health and work among the military population. NSCLBP is a

27 complex disorder with several risk factors contributing to its occurrence. Therefore, the objective

28 of our study was to estimate the prevalence and contribution of risk factors towards NSCLBP

29 among male soldiers in Saudi Arabia.

30 **Methods:**   A cross-sectional study was conducted from March 2020 to January 2021 among the

31 military personnel at Hafar Al-Batin military base, Saudi Arabia. The entire population

32 (n=62,000) at the military base were invited to participate in the study. The participants were

33   invited to participate in the study either through direct referral from in-patient and out-patient

34   departments of the military hospital or by invitation through pamphlets, email, and advertisement

35   across the offices and residential areas. Soldiers reporting lower back pain for at least 12 weeks

36   were screened for inclusion criteria at the physical therapy department of the military hospital.

37   Inclusion criteria included pain or discomfort originating from the lower back without any

38   known spinal diseases. Participants with a systemic inflammatory disorder, trauma, neurological

39   symptoms, and recent spinal surgery were excluded. All eligible participants were assessed for

40   demographic variables and risk factors and complete the Rolland Morris Disability

41   Questionnaire and WHO-Five Well-Being Index.

42   **Results**: This study identified a 46.3% prevalence of pain originating from the spine with a 2.7

43   % prevalence of NSCLBP. Spearman's rho correlations between the severity of disability due to

44   NSCLBP was strongly associated with age (r_s=0.834, p<0.01), quality of sleep (r_s=0.790,

45   p<0.01), body mass index (BMI) (r_s=0.617, p<0.01), smoking (r_s=0.520, p<0.01), co-morbidity

46   (r_s=0.357, p<0.01), but not with the level of physical activity (r_s=0.044, p=0.07).

47   **Conclusion:** There was a high prevalence of pain originating from the spine among male Saudi

48   soldiers with a relatively low prevalence of NSCLBP. However, the prevalence of disability due

49   to NSCLBP was strongly associated with age, sleep quality, BMI, smoking habit, and co-

50   morbidity.

51   **Introduction**

52

53   Low back pain (LBP) is one of the most recurring medical complaints that require health care

54   intervention. It is the most frequent type of musculoskeletal disorder causing significant

55   disability and job absenteeism (Alnaami et al., 2019; Cunningham et al., 2006). More than half

56   of the general population seeks medical advice for LBP at some point in their lives (Ferreira et

57   al., 2010). The global prevalence of LBP among the general population ranges between 15% to

58   45% (Al-Arfaj et al., 2003) and incurs a high medical cost. LBP is a multi-factorial condition,

59   and the evidence does not always support a clear cause and effect relationship (Hartvigsen et al.,

60   2018). Back pain without any known cause for 12-weeks is termed non-specific chronic low

61   back pain (NSCLBP) (Rozenberg, 2008). However, there are known risk factors associated with

62   NSCLBP. These factors can be categorized into individual and environmental factors. Individual

63   factors include a sedentary level of activity, age, smoking status, obesity, psychological stress,

64   history of back pain, and pre-existing conditions (Hulla et al., 2019). The environmental factors

65   include lifting technique, physical activity required at work, standing time, and sitting duration at

66   work (Burström et al., 2015; Campbell et al., 2011; Coenen et al., 2014; Dario et al., 2015;

67   Lardon et al., 2014).

68   Military service begins with an introductory training period. The unique characteristics of

69   military training include both the intensity and duration. Since one of the main goals of the

70   training is to improve physical performance level, the volume of physical activity increases

71   linearly during military training. In Saudi Arabia, the problem of LBP is not distinct from that in

72   other parts of the globe, and the prevalence of LBP among the general population is reported to

73   be 18.8% (Aldera et al., 2020). Specific spinal postures and physical activities have been

74   associated with LBP (Swain et al., 2020; Johanning, 2000). Soldiers are mainly at risk of

75   developing LBP due to their high physical demands of their profession. Active military

76   personnel usually carry heavy equipment during training which can lead to over-stressing of their

77   musculoskeletal system, especially the spine (Parreira et al., 2018).

78   Several risk factors have been reported to be associated with non-specific low back pain among

79   the general public (Sribastav et al., 2018). Research is scarce about the risk factors associated

80   with NSCLBP. Only one case-control study was conducted in Iran among 92 military personnel

81   to explore the association between risk factors and the incidence of NSCLBP. Authors of the

82   study reported exercises, smoking, body mass index (BMI), education level and bad posture are

83   the potential risk factors associated with NSCLBP (Ramezani et al., 2015). Therefore,

84   identifying the other additional risk factors such as quality of sleep, age, co-morbidity towards

85   the occurrence of NSCLBP in the military population may give us a better insight into its

86   prevention strategies and treatment.

87   NSCLBP can be effectively managed with patient education, postural correction, and manual

88   therapy (Stochkendahl et al., 2018). Conversely, untreated NSCLBP may lead to poor prognosis

89   and disability (Nieminen et al., 2021). The medical cost involved in the management of

90   NSCLBP is relatively lower than the more severe form of LBP such as, radiculopathies and

91   intervertebral disc prolapsed (Bachmann et al., 2009). Therefore, identifying and treating

92   NSCLBP as soon as possible to onset would significantly reduce medical costs and absenteeism

93   from work (Miyamoto et al., 2019).

94   There are regional studies that have investigated the prevalence of LBP across Saudi Arabia

95   among health care workers. For example, in Riyadh province of Saudi Arabia, 83.9% of medical

96   practitioners suffered from LBP (Almalki et al., 2016). The prevalence of LBP among medical

97   workers in the eastern region of Saudi Arabia was 79% (Al Bahrani et al., 2015), and 73.9% of

98   health care workers reported suffering from LBP in the southwest region of Saudi Arabia

99   (Alnaami et al., 2019). It was reported that 23.9 % of rehabilitation professionals seek medical

100   leave due to LBP (Abolfotouh et al., 2021). There is no research literature available about the

101   prevalence of NSCLBP among general public or military soldiers in Saudi Arabia. Military

102   personnel are at a greater risk of developing LBP due to the nature of their occupation.

103 Moreover, dietary habits, genetic make-up, culture, and routine physical activity among Saudi

104 soldiers differ from other military across the globe. Therefore, the study aimed to identify the

105 LBP, specifically NSCLBP, and the unique contribution of risk factors towards the occurrence of

106 NSCLBP among Saudi military personnel. The purpose of this cross-sectional study was to

107 estimate the prevalence and risk factors for NSCLBP among soldiers in the Saudi armed forces.

108 **Materials & Methods**

109 **Study design, participants and research setting**

110 This cross-sectional study was conducted among the entire military population (n=62,000) at

111 Hafar Al-Baten, Saudi Arabia, from March 2020 to January 2021. The military base comprises

112 administrative buildings, sports complexes, training grounds, residential areas, and general

113 hospitals.

114 King Fahd Medical City (KFMC) Institutional Review Board approved the study (IRB 19-033E).

115 Hafar Al-baten military base only recruits male soldiers; therefore only male soldiers were

116 enrolled in this study using a purposive sampling method. Participants were invited to participate

117 in the study through pamphlets, emails, and advertisements across the offices and residential

118 areas or referred to physical therapy department from in-patient or out-patient departments of the

119 military hospital. All participants who were under military training or in-service were eligible to

120 participate in this study. Soldiers reporting with LBP were screened for inclusion criteria.

121 Inclusion criteria included pain or discomfort originating from the lumbosacral region without

122 any known cause, which lasted for at least 12 weeks, without any radiating or specific spinal

123 diseases. The persistence of NSCLBP for 12 weeks is considered chronic (Hallegraeff et al.,

124 2012). Participants who were currently suffering from NSCLBP were eligible to participate in

125 the study. The informed consent form was signed by each participant, with the complete

126 information provided about the study procedures. Four physical therapists at the physical therapy

127   department at King Khalid military hospital (Hafar Batin) carried out physical examinations

128   based on a recommended clinical guideline to diagnose NSCLBP (Oliveira et al., 2018). A

129   review of medical records, identification of red flags, and radiographic imaging were conducted

130   to identify the systemic cause of LBP. The physical examination was divided into seven sections

131   that included observation (posture and gait), a functional activity that reproduced symptoms,

132   active movement of the lumbar spine and hip, palpation of the lumbar spine and sacral region,

133   assessment of core muscle such as transverse abdominis, multifidus, and pelvic control, a

134   neurological examination which includes myotome, dermatome, sensation, straight leg raise test

135   and femoral nerve test and last was pain related work issues and conflicts (McCarthy et al.,

136   2006). Participants with a prolapsed inter-vertebral disk, back surgery, or vertebral column

137   disorders were excluded from the study. However, participants with systemic disorders such as

138   hypertension or diabetes mellitus not related to the cause of backache were included in the study

139   (Figure 1).

140   The primary outcome of the study was the prevalence of NSCLBP among military personnel in

141   Saudi Arabia. Assuming a 95% confidence level, with an expected prevalence between 53.2% to

142   79.17% LBP based upon an earlier study (Awaji, 2016) with 0.05 absolute precision, the

143   required sample size was between 255 to 382 military personnel. However, the questionnaire

144   was distributed to the military population at the military base comprising 620000 military

145   personnel. A total of 28706 responded with back pain with a 46.3% response rate.

146   **Instrumentation**

147   Participants who met the inclusion criteria and signed the consent form were eligible to

148   participate in the study, with the complete information provided about the study procedures.

149   Participants were examined for demographic data such as age, weight, height, years of service

150   and interviewed for role in the military and history of smoking, and medical records were

151   reviewed for any pre-existing conditions. BMI was classified according to the WHO

152   classification as underweight (less than 18.5kg/m2), normal (18.5–24.9 kg/m2), overweight

153   (25.0–29.9 kg/m2), and obese (30.0 kg/m2 and above) (Purnell, 2018). Participants were also

154   categorized into age groups as 20-30, 31-40, and 41-50 years. Each participant had to self-report

155   the Arabic version of Rolland Morris Disability Questionnaire (RMDQ), the Arabic version of

156   Pittsburgh quality of sleep, WHO-Five Well-being Index (WHO-5), and level of physical

157   activity. The severity of disability due to back pain among participants was evaluated by a cross-

158   culturally translated and validated Arabic version of RMDQ (Maki et al., 2014). Based on the

159   RMDQ scoring, participants were characterized as mild, moderate, or severe disabilities. The

160   Arabic version of the RMDQ has a high internal consistency (Cronbach $\alpha = 0.72$) and reliability

161   (ICC = 0.900; 95% CI= 0.753-0.951) and good agreement (ICC= 0.925,CI=0.81-0.97) with the

162   English version of RMDQ (Maki et al., 2014).

163   The quality of sleep among participants was evaluated by an Arabic validated version of PSQI

164   (Suleiman et al., 2010). In scoring the PSQI, seven component scores are derived, each scored 0

165   (no difficulty) to 3 (severe difficulty). The component scores are summed to produce a global

166   score (range 0 to 21). A global score of 5 or more indicates poor sleep quality; the higher the

167   score, the worse the quality. The Arabic version of PSQI is reported to have good reliability,

168   (Cronbach $\alpha = 0.77$) acceptable internal consistency, (Cronbach $\alpha = 0.65$) and moderate to a high

169   correlation between global PSQI and five components of PSQI scores (Al Maqbali et al., 2020;

170   Suleiman et al., 2010).

171   Quality of life was evaluated by the Arabic version of the WHO-5 (Sibai et al., 2009).

172   Participants reported their quality of life status by marking on a 5-point rating scale for five

173 statements. The score was multiplied by 4 to obtain the 0-100 range. Zero stands for the worst

174 possible quality of life, while 100 stands for the best possible quality of life. The Arabic version

175 of the WHO-5 showed good internal consistency and test-retest reliability (Cronbach α= 0.88 /

176 *r*= 0.73) (Sibai et al., 2009)

177 Physical activity level was categorized into four levels based on the number of military drills

178 performed by the participants per week. Sedentary physical activity meant that the individual

179 was not involved in military drills; light meant that the individual performed military drills once

180 or twice a week; moderate implied thrice or four times a week, and vigorous implied five to all

181 days of a week.

182 **Statistical procedures**

183 Data were collected in Microsoft excel (2007) and analyzed by IBM SPSS (version 20). The

184 ordinal scale data such as level of physical activity, BMI, WHO-5, and RMDQ were analyzed

185 using Spearman rank-order analysis. Ordinal regression analysis was conducted between age,

186 years in service, smoking, military rank, quality of sleep, level of physical activity, BMI, and

187 WHO-5, with RMDQ as the independent variable. Descriptive statistics were performed to

188 generate frequency and percentage for each variable.

189 **Results**

190 Out of 62000 contacted for the survey, 28706 (46.3%) responded with pain originating from the

191 spine and 1678 (2.7%) with NSCLBP (figure 2). The mean age of military personnel with

192 NSCLBP was 32.5 ± 7.41 years and a mean BMI of 25.74 ± 3.10 kg/m2. Out of 1678

193 participants, 617 (74.5%) had mild, 679 (40.5%) moderate, or 382 (22.8%) severe intensities of

194 NSCLBP.

195   The younger age group (20-30 years) reported mild (n=617, 87.3%) to moderate (n=90, 12.7%)

196   back pain disability as compared to the older age group. A total of 228 (13.5%) participants in

197   this study were obese, out of which 93 (40.8 %) reported severe disability due to NSCLBP.

198   Participants engaging in a vigorous level of physical activity reported mild back pain disability

199   (n=222, 13.2%) compared to sedentary participants (n=206, 65.2%). The NSCLBP prevalence

200   was highest among corporal ranked military officers (n=396, 23.5%) than others. Further

201   analysis revealed that corporal ranked officers were overweight (n=216, 54.5%) and engaged in a

202   moderate level of activity (n=182, 45.9%). Out of 404 active smokers, the majority (91.8%)

203   reported mild back pain disability (Table 1).

204   Four hundred and four (48%) of participants reported a co-morbidity such as diabetes (n=141,

205   8.4%), hypertension (n=21, 1.3%), respiratory conditions (n=175, 10.4%), arthritis (n=9, 0.5%),

206   neck pain (n=97, 5.8%), and shoulder pain (n=364, 21.7%).

207   There was a strong positive correlation between RMDQ with days lost due to back pain,

208   $(r_s(1678) = .902, p = .001)$, RMDQ with age $(r_s(1678) = .834, p = .001)$, RMDQ with years in

209   service $(r_s(1678) = .828, p = .001)$, RMDQ with BMI $(r_s(1678) = .617, p = .001)$, RMDQ with

210   cigarette smoking $(r_s(1678) = .520, p = .001)$, RMDQ with quality of sleep $(r_s(1678) = .566, p =$

211   $.001)$, and a strong negative correlation between RMDQ with well-being $(r_s(1678) = -.740, p =$

212   $.001)$, and RMDQ with working hours $(r_s(1678) = -.681, p = .001)$. Details of the other

213   significant correlations between variables are given in Table 2.

214   An ordinal regression analysis was conducted to predict relationships between dependent

215   (RMDQ scores) and independent variables (BMI, age, smoking status, level of activity). An

216   increase in BMI was associated with an increase in the odds of higher scores in the RMDQ, with

217   an odds ratio of 0.106 (95% CI, 0.023 to 0.189), Wald $\chi2$ (1) = 6.270, p = 0.012. An increase in

218   age (expressed in years) was associated with an increase in the odds of higher scores in the

219   RMDQ, with an odds ratio of 0.494 (95% CI, 1.196 to 1.357), Wald $\chi 2$ (1) = 95.792, p< 001.

220   Participants who did not smoke cigarettes were -1.350 (95% CI, -2.143 to -1.013) times less

221   likely to score higher on RMDQ than smokers, with a statistically significant effect, Wald $\chi 2$ (1)

222   = 8.964, p = .003. Military personal engaging in severe military drills were -1.578 times (95%

223   CI, 1.196 to 1.357) Wald $\chi 2$ (1) = 6.270, p = 0.012, less likely to score higher on the RMDQ than

224   personnel engaging in sedentary and light military drills.

225   **Discussion**

226   The prevalence of back pain among military personnel was 46.3%, which included pain

227   originating from the lumbosacral region (54.6%), thorax region (21.5%), and cervical region

228   (17.8%). The prevalence of NSCLBP was 2.7% among the population of 62000 armed forces.

229   The low prevalence of NSCLBP in this study may be due to stringent inclusion criteria. Such as,

230   participants eligible were currently suffering from NSCLBP, pain arising from lumbo-sacral

231   region only and no history of known cause or trauma. A study conducted by Chan et al. among

232   Malaysian military personnel (n=330) reported a prevalence of 48.9% of LBP. However, LBP

233   was   assessed   through   a   questionnaire   (Nordic   Musculoskeletal   Questionnaire)   without

234   identifying the type and region of pain. The study also included female participants (n=27, 8%)

235   and LBP was associated with smoking, history of LBP, history of the accident, lifting weight,

236   and job-related activities (Chan et al., 2019). Another study conducted by Monnier et al. in 2015

237   among (n=272) Swedish armed force marines reported 19.9% and 36.0 % musculoskeletal pain

238   originating from the thoracic and lumbar region of vertebral column, respectively. The present

239   study included 97% of male marine soldiers (Monnier et al., 2015). A study conducted by Vun et

240   al. in 2018 among navy, army, and air force military personnel (n=6696) in Canada reported a

241   significant association between the mental health of armed forces and the intensity of back pain.

242   The present study included male (n=5773) and female (n=923) participants and reported 23% of

243   chronic pain arising from the lumbar region of the spine (Vun et al., 2018). A study conducted by

244   Cardoso et al. in 2018 in Brazil reported a back pain prevalence of 58.8% among military police

245   battalion, affecting their daily living activities. However, participants (n=97) with scoliosis,

246   anterior head; lumbar and cervical hyperlordosis; thoracic hyperkinesis, and decreased spinal

247   curvatures were included. The study classified disability due to back pain based on scores

248   obtained from the Oswestry Disability Index (Cardoso et al., 2018). A study by Hou et al. in

249   2013 reported that the prevalence of LBP among Chinese (n=1642) soldiers were highest among

250   armored forces (51.3%) than in the artillery (27.5%) or infantry (11.9%). Authors of the present

251   study also reported that the prevalence was higher among participants involved in night training,

252   cross-country race, and grenade-throwing. There was no formal assessment conducted for back

253   pain. Participants in the study were merely asked to recall if they had back pain in the previous

254   two months (Hou et al., 2013).

255   A study conducted by Ernat et al. in 2012 among active infantry soldiers in the USA reporting

256   acute back pain noted that the soldiers seldom seek medical care as they think that the back pain

257   is a normal part of their occupation. The low prevalence of NSCLBP in our study might be due

258   to a similar perception among Saudi male soldiers. However, future research is needed to explore

259   the perception of Saudi military about LBP. Authors of the present study also reported the

260   incidence of LBP about 39.9 per 1000 person-years among all infantrymen. However, the data

261   were extracted from the physician's retrospective medical records of military personnel (Ernat et

262   al., 2012).

263   The percentage of participants who reported smoking in our study was 24.7% (n=404). Smoking

264   was moderately correlated to the number of days lost due to back pain, higher scores on the back

265   pain disability questionnaire, higher BMI, and lower wellbeing index. About 371, 91.8% of

266   active cigarette smokers out of 404 belonged to the age group of 20-30 years and were suffering

267   from mild to moderate back pain disability. These results were supported by a meta-analysis of

268   cross-sectional studies revealing a strong association between smoking and the prevalence of low

269   back pain (Shiri et al., 2010). Authors of the present study also reported that incidence of LBP

270   was more substantial in adolescents than in adults. Therefore, an early counseling session to quit

271   smoking at an early age would improve the overall health of younger military recruits (Pirie et

272   al., 2013).

273   Physical fitness is of paramount importance among people undergoing or seeking military

274   training. Military personnel complete strenuous physical training to meet the demanding role in

275   various positions. Our study found a significant variation in the level of physical activity

276   performed at different ranks in the military. We found that the level of physical activity was

277   negatively correlated with the age group. Participants engaging in mild to moderate physical

278   activity reported statistically significant improvement in their quality of life (WHO-5) compared

279   to sedentary level class. It was also noted that participants engaging in a vigorous level of

280   physical activity only experience a mild form of disability due to LBP. The level of physical

281   activity among participants was limited due to the COVID-19 pandemic. It could be the possible

282   reason behind a lack of significance between activity level and amount of back pain disability.

283   In our study, participants in the age group of 41-50 years reported 66% severe disability due to

284   back pain compared to younger age groups. In contrast, research conducted among US veterans

285 (n= 67,696) reported that young male veterans (18-39 years) were 3.1 times more likely to report

286 severe pain than the older age group (Nahin, 2017).

287 We found that poor quality of sleep among participants reporting moderate to severe back pain

288 disability. Similarly, research conducted in US military hospitals among 757 participants

289 reported that sleep disorder is significantly associated with LBP-related health visits among the

290 military population (Rhon et al., 2019). In addition, a cohort study conducted among adults

291 reported improvement in LBP with increased sleep quality (Kovacs et al., 2018). However, there

292 is a lack of research articles regarding the quantity and quality of sleep required to recover from

293 strenuous military drills.

294 There were no significant differences in the severity of back pain disability due to the role

295 performed in the military. However, a higher number of Corporals reported mild back pain

296 disability when compared to other ranked officers. The sedentary administrative level of activity

297 performed at the military offices by the corporal–ranked officers could be the possible reason

298 behind the high prevalence of NSCLBP.

299 The quality of life assessed by WHO-5 showed that participants reporting mild back pain

300 disability were at minimal risk, and those with severe back pain disability were at substantial risk

301 of developing poor health-related quality of life.

302 **Limitations**

303 There are many limitations to this cross-sectional study. There is a bias involved in self-reported

304 questionnaires. However, validated Arabic-translated questionnaires were used to overcome the

305 language barrier. The type of military-specific activities was not evaluated for each participant.

306 The Novel Coronavirus pandemic during the study period may have affected the reported level

307 of activity among participants. The inclusion of only male soldiers in our study limits

308 transferability to other militaries. Moreover, the physiological characteristic such as frequency of

309 previous episodes, intensity of pain and remission period was not assessed among participants.

310 The data were obtained from one military base in Saudi Arabia, therefore limiting the

311 generalization to the entire military population in Saudi Arabia. However, the Hafar batin

312 military city in Saudi Arabia is the largest military base in Saudi Arabia.

313 **Conclusions**

314 Our study reports a high prevalence of pain disability originating from the spine (46.8%) among

315 military personnel in Saudi Arabia with a 2.7% prevalence of NSCLBP. Strong associations

316 were found between back pain disability and age group, role in military, smoking, BMI, level of

317 activity, pre-existing conditions, quality of sleep, and WHO-5 among military personnel. The

318 data can be used to develop risk management strategies such as smoking cessation programs at

319 the military base to reduce the prevalence of NSCLBP. The research data can be utilized to

320 update the health care policy for early rehabilitation of military personnel exhibiting signs and

321 symptoms of NSCLBP. The research data can be used to conduct future research on association

322 between risk factors and NSCLBP among military population globally.

323 **Acknowledgments**

324 We would like to thank the Academic and training department of Northern Area Armed Forces

325 Hospital, especially the research unit, for supporting and encourage us through the research

326 process.

327

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Demographic variables and grouping of variables for military personal with non-specific chronic low back pain.

n, number; %, percentage; WHO, world Health Organization

Variables	Grouping	Mild		Moderate		Severe	
		n	%	n	%	n	%
Age Group (years)	20-30	617	87.3	90	12.7	0	0.0
	31-40	0	0.0	486	72.9	181	27.1
	41-50	0	0.0	103	33.9	201	66.1
Body Mass Index (kg/m²)	Normal	436	87.0	65	13.0	0	0.0
	Over Weight	181	19.1	479	50.5	289	30.5
	Obesity	0	0.0	135	59.2	93	40.8
Year of Service (Years)	2 to 5	617	85.2	107	14.8	0	0.0
	6 to 10	0	0.0	500	67.1	245	32.9
	11 to 15	0	0.0	72	34.4	137	65.6
Level of Physical Activity	Sedentary	0	0.0	110	34.8	206	65.2
	Light	0	0.0	301	82.0	66	18.0
	Moderate	395	51.1	268	34.7	110	14.2
	Vigorous	222	100.0	0	0.0	0	0.0
Role in the military	Lieutenant Colonel	1	100.0	0	0.0	0	0.0
	Major	1	33.3	1	33.3	1	33.3
	Captain	0	0.0	1	33.3	2	66.7
	1st Lieutenant	1	50.0	0	0.0	1	50.0
	Master sergeant	59	29.4	90	44.8	52	25.9
	First class sergeant	71	38.4	77	41.6	37	20.0
	Sergeant	93	40.3	100	43.3	38	16.5
	Vice sergeant	73	36.3	77	38.3	51	25.4
	Corporal	146	36.9	155	39.1	95	24.0
	First class private	81	38.6	76	36.2	53	25.2
	New recruit (JUNDI)	91	37.1	102	41.6	52	21.2
Smoking	Smoking	371	91.8	15	3.7	18	4.5
	Non-Smoking	246	19.3	664	52.1	364	28.6
Pre-existing Conditions	None	559	64.2	113	13.0	199	22.8
	Yes	58	7.2	566	70.1	183	22.7
Pittsburgh Quality of Sleep index	Good Sleep	617	56.5	353	32.3	123	11.3
	Poor Sleep	0	0.0	326	55.7	259	44.3
WHO- Five Well-Being Index	Low Risk	617	74.5	208	25.1	3	0.4
	Low-Medium Risk	0	0.0	293	82.3	63	17.7
	Medium Risk	0	0.0	11	26.8	30	73.2
	High-Medium Risk	0	0.0	49	35.8	88	64.2
	High Risk	0	0.0	118	37.3	198	62.7

Correlation matrix

BMI; body mass index, RMDQ; Rolland Morris Disability Questionnaire. Spearman's rho correlation is significant at the 0.01 level (2-tailed). N=1678, * p< .05; **p< .01

		1	2	3	4	5	6	7	8	9	10	11
1	Level of physical activity											
2	Role in the military	.007										
3	Smoking	-.272**	-.023									
4	Co-morbidity	-.547**	-.012	.514**								
5	Number of days lost (days)	-.044	-.036	.568**	.458**							
6	Age	.036	-.022	.624**	.385**	.838**						
7	Years in service	.033	-.022	.612**	.382**	.831**	.984**					
8	BMI	-.104**	-.036	.442**	.357**	.644**	.681**	.688**				
9	Well being index 5 (WHO)	-.096**	.009	-.423**	-.175**	-.729**	-.862**	-.864**	-.633**			
10	RMDQ	.044	-.018	.520**	.357**	.902**	.834**	.828**	.617**	-.740**		
11	Pittsburgh Quality of sleep	-.044	-.048*	.517**	.425**	.867**	.735**	.724**	.566**	-.614**	.790**	
12	Working hours	.163**	.024	-.664**	-.624**	-.875**	-.828**	-.818**	-.681**	.693**	-.813**	-.779**

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Figure 1

Procedure of Invitation, recruitment and physical examination of the military personnel
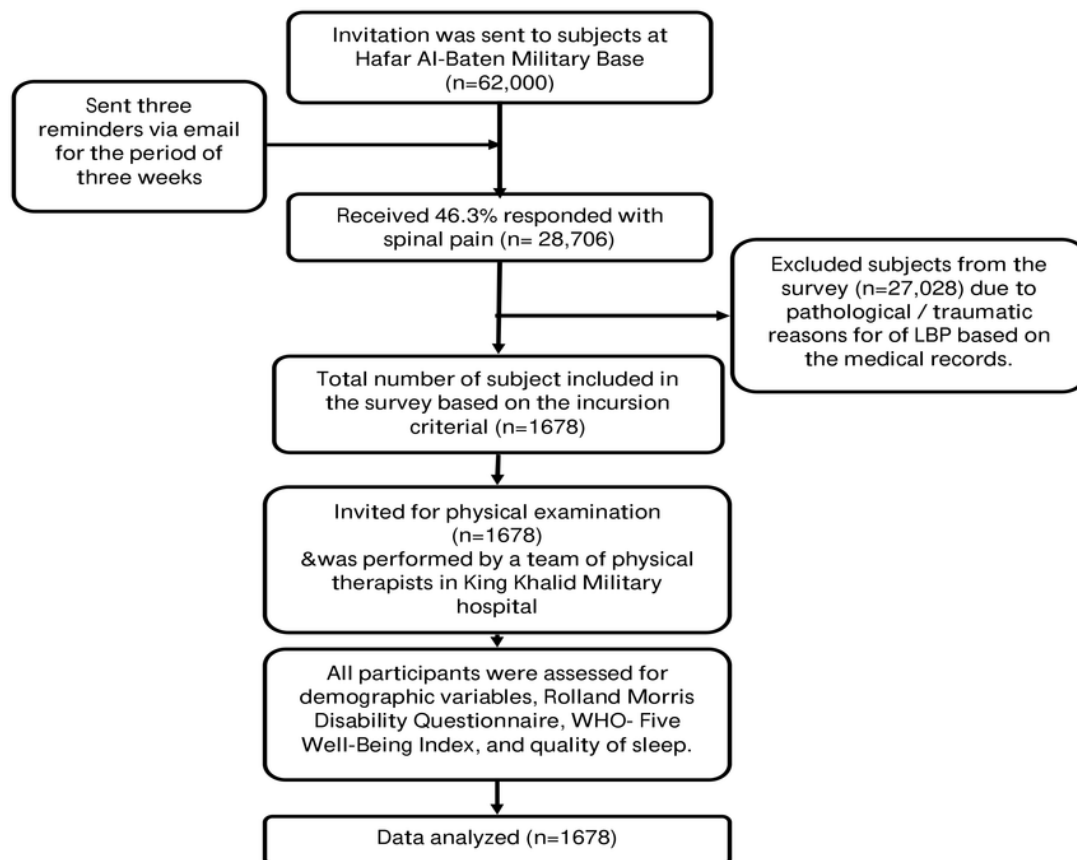
Figure 2

Flow Chart of the sample population, respondents, inclusion, and analysis.

*Percentage calculated for the participants who responded to have back pain, ** Percentage calculated from the sample population.*