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Original Article

The point prevalence and factors associated with neck pain

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Background

Neck pain is a significant disabling condition. Prevalence of neck pain is still not clearly stated in the literature due to the variation of its definition. It has a unique number of risk factors like history of neck pain, trauma, and certain sports injuries. In this study we measured the point prevalence of neck pain and the factors associated with it.

Materials and Methods

This cross-sectional observational study included a total of 461 participants. The collected data comprised participant characteristics: demographic, socioeconomical status, and nature of work. The Arabic Neck Disability Index was used to assess neck pain. Specific questions about possible associated factors were asked, such as duration of using electronics, type of posture, duration of reading.

Results

The neck pain was stated by 64.6% of the study participants. The results demonstrated that participants who reported neck pain were mostly females (70.5%), single (56.6%), or had high educational level (70.2%). Slight infrequent headaches were the most significant Neck Disability Index indicator in 39.5% of the study participants.

Conclusion

The prevalence of neck pain was 64.6%, of which, mostly were females. Body postures, reading hours, work-type, and self-rated use of cellphones and PCs were all significantly associated with neck pain. Moreover, headache, concentration, and working habits were the top most significant indicators of the NDI. However, headache was the most significant.

Keywords: *Neck, Neck pain, Prevalence, Risk factor, Saudi Arabia, Neck Disability Index.*

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1. Introduction

The Global Burden of Health defined neck pain as ”pain in the neck with or without pain referred to one or both upper limbs that lasts for at least one day” (1). Neck pain is a widespread problem that causes disability and significant impact on the quality of life (2). It is a major health issue that has a substantial impact on business and economic cost (2, 3). There is a stark contrast between the results of prevalence of neck pain most probably due to the discrepancy in the definition of neck pain and the methods of conducting epidemiological studies to measure the prevalence of neck pain making it difficult to compare between results (4). Case in point, the point prevalence of neck pain was mentioned to range between 6% and 20% (6, 7). Also, it is estimated that the lifetime prevalence lies between 22% and 70% (6). In general, prevalence increases in females, higher-income countries compared to lower and middle-income countries, and highest in the 40–45 age group (4, 6). One report suggested that 54% of individuals sustained neck pain in the previous six months, 30% will suffer from chronic symptoms, and 37% will have persistent symptoms for at least 12 months (6).

Neck pain has a unique number of risk factors like previous episodes of neck pain, trauma (e.g., traumatic brain and whiplash injuries), and some specific sports injuries (e.g., wrestling, ice hockey, football) (7). In addition, office and computer workers were found to have higher incidence of neck pain (8). The use of Neck Disability Index (NDI) in multiple studies estimated neck pain to be high in dentistry and military office workers (9, 10). NDI is a reliable self-reported questionnaire that assesses neck pain (11). The main objective of this study is to explore the point prevalence of neck pain and the factors influencing it within the general population.

2. Materials and Methods

2.1. Study design, population, and setting

This is an observational cross-sectional study conducted among the general population of Saudi Arabia. Data were collected using an online self-administered questionnaire distributed via social media and through health campaigns visitors. Google Forms platform was used to display the questionnaire. The project was approved by King Saud University Institutional Review Board (approval no. E-19-3717).

2.2. Study instrument

A self-administered questionnaire was used and distributed by the study team to the participants after stating the study aims and ensuring anonymity and confidentiality. The questionnaire consisted of three parts. First part included questions related to demographic data including gender, age, education, monthly income, marital status, type of job, and specialty. The second part included the Arabic version of NDI (NDI-Ar) to assess neck pain (NDI-Ar available at http://links.lww.com/BRS/A749) (13). the NDI-Ar consists of a total of 10 neck disability indicators, which are: Pain intensity, Personal care, Lifting ability, Reading, Headaches, Concentration, Work, Driving, Sleep, and Recreational activities. Finally, respondents were asked about different factors of neck pain, such as duration and positions of cellphone and computers usage and reading during the day.

2.3. Statistical analysis

The mean and standard deviation analysis were used for describing the continuous measures and the frequencies and percentages for the categorically measured variables. Kolmogorov–Smirnov statistical

test of normality with histograms were used to assess the normality of metric variables. Levene's test was used for assessing the statistical assumption of homogeneity of variance. An overall score for neck disability was computed via adding up people's perceptions of the 10 NDI indicators yielding a score between 0 and 50 which was then categorized based on cut-off values (13). The Unpaired samples *t*-test and the One-way ANOVA test were used to assess the statistical significance of mean NDI score across the levels of the respondents' categorically measured sociodemographic characteristics, ergonomic behaviors, and activities. SPSS IBM version 21 program was used for data analysis. Alpha significance level was considered at 0.050 level.

3. Results

3.1. Respondents

Four hundred and sixty-one respondents completed the questionnaire. Table I displays the respondents' sociodemographic and occupational characteristics. The results showed that most of the respondents were females (70.5%) with a mean age of 32.17 (+13.45) years. They were mostly single (56.6%), had a university degree (64.9%), and students (43.8%). Of those who are employed, the majority were health workers (65.9%) mainly doing office work (45.3%). The majority had a household income of SR 5000 or less (47.7%).

3.2. Point prevalence

The overall mean of NDI score was 8.10/50 (+6.55). The point prevalence of neck pain was 64.6% among the study participants. The classification of the respondents' perceived neck is shown in Table II, with the majority showing either no neck disability (35.1%) or mild neck disability (48.2%).

3.3. Associated factors

Respondents were asked to choose all that applied to them of different figures showing different body postures for reading and using a cellphone. Postures are displayed in Figure **1**. We found that 36.2% of the respondents use Posture 1 which is a posture associated with neck pain while only 20.4% had selected Posture 2 which is less associated with neck pain (14). As for cellphone usage posture, only 32.2% use the thoracic hyperkyphosis as shown in Posture 5, while the majority had incorrectly used Posture 6 (14). Respondents who used the positions associated with neck pain (Postures 1, 3, 4, and 6) did not have a significantly higher NDI score, $p > 0.050$. However, respondents who used the position in Posture 2 scored a significantly lower mean NDI score (M = 6.72, SD = 6.52) than those who did not (M = 8.38, SD = 6.53), $p = 0.028$. Similarly, respondents who used the straight spine position in Posture 5 scored a significantly lower mean NDI score (M = 6.89, SD = 6.48) than those who did not (M = 8.40, SD = 6.54), $p = 0.037$. Figure **2** displays the relationship between the mean NDI scores and the various positions. In order to explore what may explain why respondents experienced less or greater neck disability, we compared the overall mean NDI score across their sociodemographic characteristics, occupational factors, and ergonomic habits and activity levels. The resulting findings are displayed in Table III. Female respondents measured significantly ($p < 0.001$) greater neck disability (M = 9.18, SD = 6.63) than males (M = 5.32, SD = 5.50). Respondents aged 41–50 years had significantly ($p < 0.001$) greater neck disability (M = 10.33, SD = 7.67) than those aged between 20 and 30 years. Figure **3** clearly shows that respondents aged <31 years had lower mean NDI in general than those aged 31 years or older. In addition, single respondents measured significantly greater NDI scores compared to those who are married or were married at some point (married, widowed,

Table I. Respondents' sociodemographic and professional characteristics, $N = 461$.

		Frequency	Percentage
Sex	Female	325	70.5
	Male	136	29.5
Age (yr) – Mean (SD)			32.17 (13.45)
Age groups (yr)	11–19	20	4.3
	20–30	255	55.3
	31–40	71	15.4
	41–50	49	10.6
	>=51	66	14.3
Marital state	Never married	261	56.6
	Married/Divorced	200	43.4
Educational level	High school or less	102	22.1
	University degree	299	64.9
	Master's degree	27	5.9
	Higher studies	33	7.2
Households monthly income (SAR)	<5000	220	47.7
	5000–10000	64	13.9
	10000–20000	96	20.8
	>20000	81	17.6
Employment	Housewife/Retired	39	8.5
	Physician	56	12.1
	Laboratory, optics, and respiratory technicians, & nurses	53	11.5
	Student	202	43.8
	Managerial/Secretarial	67	14.5
	Teacher	44	9.5
Healthcare worker/Specialist	No	157	34.1
	Yes	304	65.9
Specialty	Physician	57	12.4
	Laboratory, optics, and respiratory technicians & nurses	52	11.3
	Not healthcare worker	150	32.5
	Medical/Healthcare student	202	43.8
Type of work you do at your Job	Mostly office work	209	45.3
	Mostly physical and mobility work	163	35.4
	Mixed office and physical work	89	19.3

Table II. The respondents' risk of neck disability classification based on the NDI total score.

	Frequency	Percentage
No disability 0–4 points	162	35.1
Mild disability 5–14 points	222	48.2
Moderate disability 5–24 points	67	14.5
Severe disability 25–34 points	9	2
Completely Severe disability >=35 points	1	0.2

or divorced), $p < 0.001$. Only respondents with a master's degree had measured significantly greater NDI score (M = 10.48, SD = 7.02) compared to those educated with higher studies (M = 5.27, SD = 5.79). Respondents with household income of 5000–10,000 SR had measured significantly ($p = 0.031$) greater

NDI than those in other categories. Non-healthcare workers had significantly greater neck disability than healthcare workers, $p < 0.001$. Furthermore, respondents' duration of reading hours and type of work did not converge significantly on their NDI mean scores. However, different sitting locations for reading differed significantly with regards to their NDI score. It was evident that respondents who preferred reading while sitting on a chair (M = 7.13, SD = 6.43) had significantly lower mean NDI score than those who preferred reading on the floor on average (M = 9.36, SD = 7.10).

3.4. NDI indicators

Table IV displays the respondents' perceptions of the NDI indicators. The findings from the descriptive analysis showed that most respondents had no neck pain at the moment (41.2%). With regards to personal care, most of the respondents could look after themselves without pain (86.3%). Furthermore, 20.6% had trouble lifting objects off the floor due to pain, but they could manage lifting objects properly positioned. As for reading, 33.6% had slight neck pain with reading. When asked to indicate their headaches levels, the majority of the respondents (39.5%) had slight infrequent headaches. In addition, respondents were asked to indicate their level of concentration ability and 44.3% had normal concentration ability with no difficulty. When asked to rate their working ability with their neck disability, we found that the majority (51.4%) of the respondents had no difficulty working and worked as much as they wanted. Driving ability was assessed, the resulted findings showed that 19.7% had slight neck pain while driving as long as they wanted. Twenty one percent of the respondents had slight sleep disturbance (<1 hr) due to neck pains. Finally, 28.2% were able to participate in all recreational activity they wanted with some pain.

4. Discussion

The present study explored different aspects of neck pain. We assessed neck pain point prevalence, associated factors, and the indicators of the NDI. The associated factors assessed included the following: gender, age, marital status, education level, monthly income, job nature, reading duration and position, duration and position of computers and cellphones usage. The NDI carries 10 indicators which are: Pain intensity, Personal care, Lifting ability, Reading, Headache, Concentration, Work, Driving, Sleep, and Recreational activities.

The prevalence of neck pain was 64.6% among our study respondents. Females had a higher prevalence of neck pain at 70.5% which was similar to Algarni et al. at 60.6% and Yue et al. at 67% (15, 16). On the other hand, Meisha et al. and Weleslassie et al. reported that most of their population were males with a prevalence of 54.3% and 65.6%, respectively (17, 18). Moreover, Meisha et al. reported that male dentists account for 70% with the most pain located in the lower back, neck, and shoulder (17). Additionally, Weleslassie et al. indicated that 65.6% of male medical students experienced neck pain the most among the population (18). The majority of the neck pain population were aged from 20 to 30 years old, in concordance, Meisha et al. reported that the most prevalent age group was between 25 and 35 years old (17). However, in contrast, in Yue et al.'s study, the age group most affected by neck pain was 19 to 29 years old (16). Additionally, 56.6% of our neck pain population is unmarried. Similarly, Weleslassie et al. revealed that 97.9% of the participants were single, which was opposite to Alghadir et al. who revealed that 78.8% were married (18, 19). A lower NDI score was found to be associated with healthcare workers, which accounts for 65.9% of our study participants. Conversely, Alwazzan et al. documented that 73.5% of dentists complained of neck pain (20). Meisha et al. also published that 84.6% of neck pain was reported by

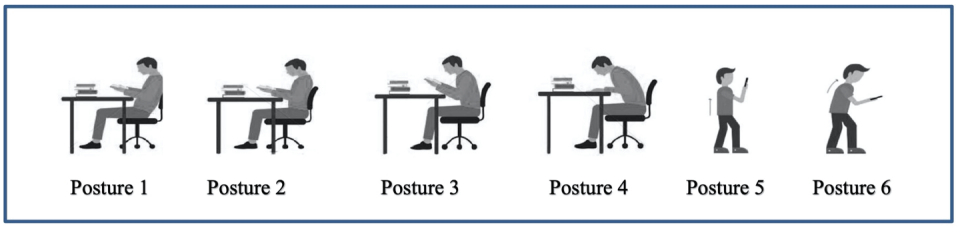

Figure 1. Different reading and cellphone usage postures.

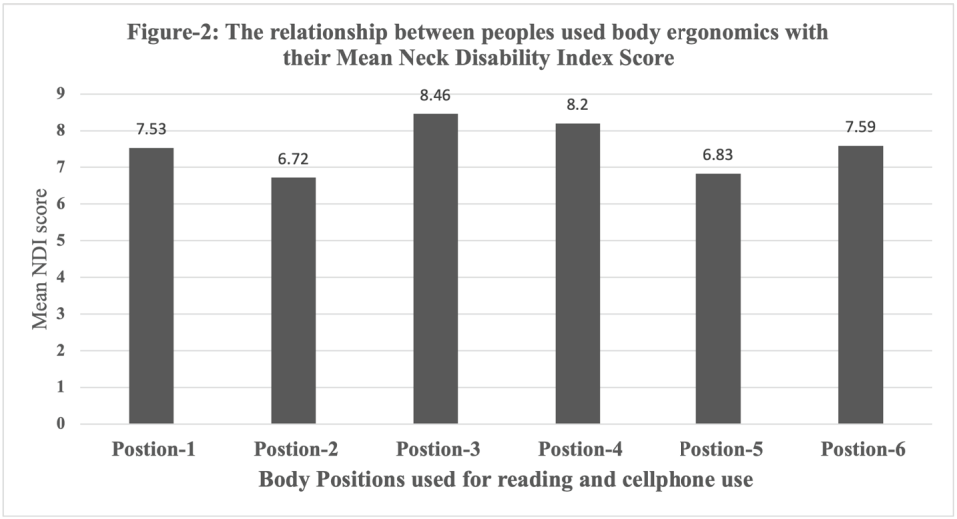

Figure 2. The relationship between people's used body ergonomics with their mean Neck Disability Index score.

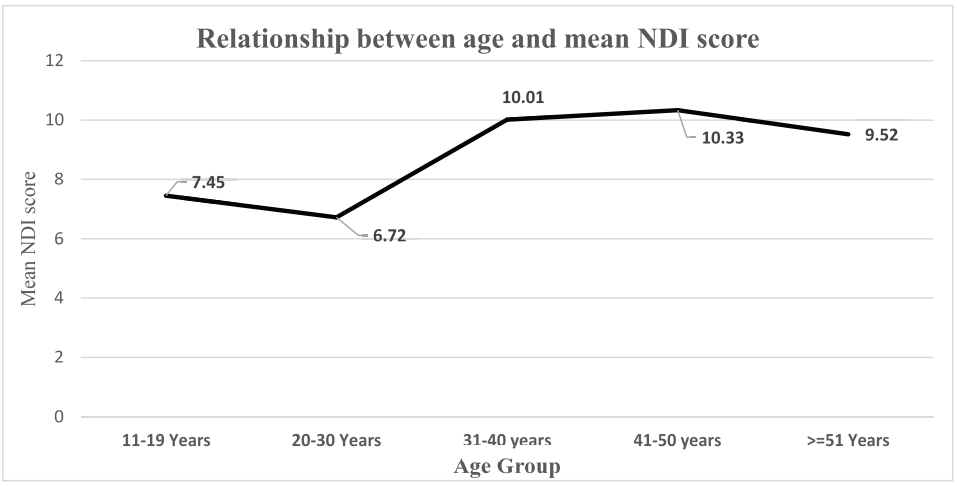

Figure 3. Relationship between age and mean NDI score.

dentists (17). Additionally, Almarwani et al. reported neck and back pain in 70% of the ophthalmologists and allied eye care professionals (21).

This study explored factors that were associated with neck pain. These include body postures, where most of the respondents chose the neck flexion posture in reading accounting for 36.2%. Similarly, Xie et al. explained that the most neck pain patients used a neck posture, where the cervical spine is flexed applying pressure on the neck muscles (22). In our study, 45.3% of the neck pain population admitted that their work is mostly office work. Correspondingly,

Table III. Bivariate analysis of the respondents' perceived Neck Disability Index across the levels of their sociodemographic, professional characteristics, behaviors, $N = 461$.

		Mean (SD) – NDI score	Test statistic	P-value
Sex	Female	9.18 (6.63)	t(303.21) = 6.48	<0.001
	Male	5.32 (5.49)		
Age (yr) – Mean (SD)				
Age groups (yr)	11–19	7.45 (4.10)	f(4,93.5) = 6.16	<0.001
	20–30	6.72 (5.68)		w
	31–40	10.01 (6.71)		
	41–50	10.33 (7.67)		
	>=51	9.52 (8.00)		
Marital state	Never married	9.79 (5.57)	t(359.3) = 4.63	<0.001
	Married or divorced	9.68 (7.35)		
Educational level	High school or less	8.25 (7.10)	f(3,457) = 3.296	0.02
	University degree	8.10 (6.33)		
	Master's degree	10.48 (7.02)		
	Higher studies	5.27 (5.79)		
Households monthly income (SAR)	<5000	6.99 (5.78)	f(5,169.01) = 6.99	<0.001 w
	5000–10000	10.17 (7.00)		
	10000–20000	9.93 (7.25)		
	>20000	7.01 (6.52)		
Employment	Housewife/Retired	10.49 (8.12)	f(5,135.5) = 6.31	<0.001
	Physician	6.18 (6.02)		
	Laboratory, optics and respiratory technicians, & nurses	9.38 (6.80)		
	Student	6.68 (5.65)		
	Managerial/Secretarial	9.04 (6.23)		
	Teacher	11.45 (7.50)		
Healthcare worker/Specialist	No	10.23 (7.30)	t(261.5) = 4.95	<0.001
	Yes	6.91 (5.84)		
Specialty	Physician	6.18 (6.02)	f(3,145.0) = 10.12 w	<0.001
	Laboratory, Optics and Respiratory Technicians, & Nurses	9.38 (6.80)		
	Not healthcare worker	10.13 (7.16)		
	Medical/Healthcare student	6.68 (5.65)		
Type of work you do at your job	Mostly office work	7.50 (5.97)	f(2,458) = 1.6	0.211
	Mostly physical work	8.28 (7.04)		
	Mixed office and physical work	8.89 (6.88)		
How much time do you spend reading per day? (hr)	<1	7.97 (6.38)	f(3,457) = 0.40	0.779
	1–2	7.69 (6.97)		
	3–5	8.29 (6.31)		
	>5	8.71 (6.71)		
Where/ How do you prefer reading?	On bed	8.93 (6.47)	f(2,458) = 4.8	0.009
	Sitting on chair	7.13 (6.43)		
	Sitting on the ground	9.36 (7.10)		

Janwantanakul et al. and Celik et al. documented that 42% and 52.2% of office workers suffer from head

Table III. (Continued).

		Mean (SD) – NDI score	Test statistic	P-value
How much time do you spend using PC/Cellphone per day? (hr)	<1	6.00 (5.37)	f(4,456) = 1.23	0.296
	1–2	8.45 (6.99)		
	3–5	7.36 (6.66)		
	5–7	8.02 (6.29)		
	>7	8.97 (6.55)		
What do you do to relief the Neck discomfort				
Massaging and rubbing the neck	No	7.95 (6.65)	t(459) = 0.23	0.815
	Yes	8.10 (6.51)		
Do muscle and neck exercise	No	8.02 (6.67)	t(459) = 0.15	0.882
	Yes	8.11 (6.31)		
Take pain killers	No	6.87 (5.25)	t(212.7) = 4.95	<0.001
	Yes	10.46 (8.14)		
Uses body ergonomic positions				
Use of Postion-1	No	8.34 (6.73)	t(459) = 1.3	0.206
	Yes	7.53 (6.22)		
Use of Postion-2	No	8.38 (6.53)	t(459) = 2.20	0.028
	Yes	6.72 (6.52)		
Use of Postion-3	No	7.85 (6.40)	t(459) = 0.93	0.353
	Yes	8.46 (6.87)		
Use of Postion-4	No	7.96 (6.74)	t(259.8) = 0.40	0.699
	Yes	8.20 (6.22)		
Use of Postion-5	No	8.40 (6.54)	t(459) = 2.10	0.037
	Yes	6.89 (6.48)		
Use of Postion-6	No	8.62 (7.37)	t(378.9) = 1.63	0.104
	Yes	7.59 (5.79)		

and neck pain, respectively (23, 24). Furthermore, De loose et al. documented that the one-year prevalence of neck pain was 65% military office workers who had computer tasks as their main activity (10). Our results did not demonstrate a significant impact of reading hours and type of work on the mean neck disability score. Unlike Seidel et al. who stated that more than 7 hrs per day working on occupational computer users had higher rates of neck pain. Furthermore, floor sitting when reading measured the lowest mean neck disability score compared to other sitting locations in our study. In contrast to Heneghan et al., sitting position for more than 10 hrs with less than 150 min of physical activity a week had a reduced thoracic mobility which leads to neck pain (25). Furthermore, participants with a monthly income between 10,000 and 20,000 SR (≈2500 — 5000 USD) and having a higher education demonstrated a high mean neck disability score among the remaining respondents. Interestingly, Nolet et al. reported that a higher education and an annual household income between $20,001 and $40,000 (34.6%) resulted in a high incidence of neck pain (26). We found that the increased use of cellphones and PCs led to more neck pain which eventually measured a high mean neck disability score. This is in line with Alabdulwahab et al. whose results showed that long-time use of smartphones/cell-phones had a negative impact on posture resulting in neck pain and disability (27).

Table IV. Descriptive analysis of the respondents' perceptions of the indicators of the Neck Disability Index, $N = 461$.

		Frequency	Percentage
Pain intensity	I have no pain at the moment	190	41.2
	The pain is very mild at the moment	106	23
	The pain is moderate at the moment	106	23
	The pain is fairly severe at the moment	55	11.9
	The pain is very severe at the moment	3	0.7
	The pain is the worst imaginable at the moment	1	0.2
Personal care	I can look after myself normally without causing extra pain	398	86.3
	I can look after myself normally but it causes extra pain	56	12.1
	It is painful to look after myself and I am slow and careful	6	1.3
	I need some help but manage most of my personal care	1	0.2
Lifting ability	I can lift heavy weights without extra pain	290	62.9
	I can lift heavy weights but it gives extra pain	93	20.2
	Pain prevents me from lifting heavy weights off the floor, managed if they are conveniently positioned	12	2.6
	Pain prevents me from lifting heavy weights, can manage light to medium	23	5
	I can't lift very light weights	43	9.3
Reading	I can read as much as I want to with no pain in my neck	193	41.9
	I can read as much as I want to with slight pain in my neck	155	33.6
	I can read as much as I want with moderate pain in my neck	99	21.5
	I cannot read as much as I want because of moderate pain in my neck	8	1.7
	I can hardly read at all because of severe pain in my neck	6	1.3
Headaches	I have no headaches at all	112	24.3
	I have slight headaches that come infrequently	182	39.5
	I have moderate headaches which come infrequently	90	19.5
	I have moderate headaches which come frequently	38	8.2
	I have severe headaches which come frequently	34	7.4
	I have headaches almost all the time	5	1.1
Concentrating	I can concentrate fully when I want to with no difficulty	204	44.3
	I can concentrate fully when I want to with slight difficulty	150	32.5
	I have a fair degree of difficulty in concentrating when I want to	73	15.8
	I have a lot of difficulty in concentrating when I want to	23	5
	I have a great deal of difficulty in concentrating when I want to	11	2.4
Working	I can do as much work as I want to	237	51.4
	I can do my usual work, but no more	151	32.8
	I can do most of my usual work, but no more	58	12.6
	I cannot do my usual work	10	2.2
	I can hardly do any work at all	4	0.9
	I cannot do any work at all	1	0.2
Driving	I can drive my car without any neck pain	293	63.6
	I can drive my car as long as I want with slight pain in my neck	91	19.7
	I can drive my car as long as I want with moderate pain in my neck	45	9.8
	I cannot drive my car as long as I want because of moderate pain in my neck	9	2
	I can hardly drive at all because of severe pain in my neck	2	0.4
	I cannot drive my car at all	21	4.6
Sleeping	I have no trouble sleeping	233	50.5
	My sleep is slightly disturbed (less than 1hr sleepless)	101	21.9
	My sleep is mildly disturbed (1–2 hr sleepless)	65	14.1
	My sleep is moderately disturbed (2–3 hr sleepless)	35	7.6
	My sleep is greatly disturbed (3–5 hr sleepless)	20	4.3
	My sleep is completely disturbed (5–7 hr sleepless)	7	1.5

In this study, we assessed the NDI indicators which comprise the NDI score. Of the 10 indicators, slight infrequent headaches measured the most significant

Table IV. (Continued).

		Frequency	Percentage
Recreation	I am able to engage in all my recreation activities with no neck pain at all	286	62
	I am able to engage in all my recreation activities, with some pain in my neck	130	28.2
	I am able to engage in most, but not all, of my usual recreation activities because of pain in my neck	32	6.9
	I am able to engage in a few of my usual recreation activities because of pain in my neck	7	1.5
	I can hardly do any recreation activities because of pain in my neck	2	0.4
	I cannot do any recreation activities at all	4	0.9

as 39.5%. For that, it has a major impact on neck disability score. This is in contrast to Saltychev et al., who illustrated that headaches were false influencers that do not impact physical functioning and that an external factor is the main reason for this neck disability (28). Also, respondents had slight pain while reading but that did not interfere with the quantity of reading (33.6%) along with a slight difficulty in concentration (32.5%) and working habits (32.8%). Similar to Saltychev et al., concentration demonstrated higher levels of disability and respondents were expected to have this complaint (28). Interestingly, respondents experienced some pain associated with recreational activities (28.2%). However, Velde et al., revealed that recreational activities were observed rarely as it occupies a narrow interval (disordering threshold) (29). Lastly, the rest of the indicators measured less significance to the NDI compared to the headache indicator which showed a great impact.

In this study, the point prevalence and sample size were major limitations. The point prevalence provides a characteristic measure over an interval of time which, along with the small sample size, restricted generalizability of the results. However, there were significant findings allowing recommendations for a future national prevalence study to be made. A possible selection bias cannot be excluded. Furthermore, since 65% of the participants were health-care workers, which could share the same risk factors, that might have increased the point prevalence in a biased manner. We recommend further research projects to include back pain as a significant risk factor of neck pain. We also recommend future projects to deliver feedback to participants including awareness of risk factors and management options.

5. Conclusion

The present study explored different aspects of neck pain including prevalence, risk factors, and the indicators of the NDI. The prevalence of neck pain was 64.6%, of which mostly are females. Poor body postures, reading hours, work-type, and self-rated use of cellphones and PCs were all significant risk factors. Moreover, headache, concentration, and working habits were the top most significant indicators of the NDI. However, headache was the most significant.

6. Ethical Approval

Informed consents were obtained from the participants. Guardian consent were obtained from participants <18 years of age. Participants were informed that they can withdraw from their participation at any time, and that all data will be handled confidentially. The King Saud University Institutional Review Board approved the project with approval number: E-21-5819.

Acknowledgments

None.

Conflict of Interest

None.

Authors' Contributions

WA and FA conceived and designed the study and conducted research. MA, RA, and HA handled research materials and methodology. NA and SA prepared the first and final draft. All authors reviewed and approved the final draft.

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