CAHIERS MAGELLANES-NS
Volume 07 Issue 1
2025

ISSN:1624-1940
http://magellanes.com/

ASSESSMENT OF SLEEP QUALITY IN PATIENTS WITH NASAL SEPTAL DEVIATION (NSD) IN SAUDI ARABIA

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Abstract

Background: Nasal septal deviation (NSD) is a common anatomic finding that may cause a subjective complaint of nasal obstruction. Past studies have shown that NSD is prevalent in people of all ages, ranging from 0.93% to 55%. The majority of the clinical characteristics associated with NSD are caused by one side of the nasal cavity being entirely closed and the nasal mucosa on the deviated portion being excessively exposed to air. Previous studies show patients with deviated nasal septum show higher results on PSQI scale. This research is needed because there is a significant lack of studies focusing on the quality of sleep in patients with nasal septum deviation especially in Saudi Arabia. **Objectives**: To assess the impact of nasal septal deviation on sleep and to assess sleep quality among these patients. **Methodology**: A cross-sectional survey was carried out in Saudi Arabia from July to December 2024. The study's population consisted of Saudi NSD patients aged 18-65 who had not had nasal surgery or major intervention. individuals with other sleep disorders, prior nasal surgery, other nasal conditions, severe chronic illnesses, those on medications affecting sleep, or individuals who refuse to participate was excluded. The sample size was calculated by a formula with a 95% confidence interval and 5% margin of error which resulted in a minimum sample size is 384 participants. **Results**: The study assessed sleep quality in 567 patients with nasal septal deviation (NSD) in Saudi Arabia, revealing significant findings. A majority (84.5%) reported poor sleep quality, with 39.2% struggling to fall asleep

ISSN:1624-1940
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multiple times weekly. Notably, 67.0% experienced moderate to severe nasal blockage, impacting overall sleep. The analysis indicated a statistically significant relationship between sleep quality and factors such as age, gender, and monthly income, while nasal blockage correlated with age and income as well. These findings underscore the critical link between NSD and sleep disturbances, highlighting the need for further research and clinical intervention. **Conclusion:** The findings of this study underscore the significant impact of nasal septal deviation on sleep quality among patients in Saudi Arabia. The high prevalence of sleep disturbances, as indicated by elevated PSQI scores and the correlation with nasal obstruction severity, highlights the need for comprehensive evaluations and interventions for individuals suffering from NSD.

Keywords: Nasal Septal Deviation (NSD), Sleep Quality, Saudi Arabia.

Introduction:

Nasal septal deviation is a common anatomical finding that may cause nasal obstruction. Anterior rhinoscopy and nasal endoscopy can be used to evaluate the nasal septum, which is crucial for preoperative planning, functional restoration, and aesthetic appeal [1]. Past studies have shown that NSD is prevalent in people of all ages, ranging from 0.93% to 55%. Furthermore, this research used several classifications [2]. Rhinoplasty or septoplasty may be necessary for up to 50% of nasal abnormalities [3]. Thorough preoperative evaluation, using tools like rhinoscopy, endoscopy, and CT scans, is crucial for effective non-smiling rhinoplasty. CT scans provide clear visualization of the paranasal sinuses and nasal anatomy [4].

According to estimates, the nasal septum is not precisely in the midline in 80% of people, however only in a small percentage of those cases is the deviation sufficient to result in nasal blockage [5]. The majority of the clinical characteristics associated with DNS are caused by one side of the nasal cavity being entirely closed and the nasal mucosa on the deviated portion being excessively exposed to air [6]. In general, the rhinologic symptoms of this widespread nasal pathology worsen the quality of lifestyle (QOL) [7].

In 2016, a research study was conducted to evaluate the sleep quality of patients with nasal septal deviation. The results showed that 85% of patients with a deviated nasal septum had higher scores on all components of the PSQI scale, indicating worse sleep quality compared to 25% of the control group who did not complain of nasal obstruction due to deviation [8]. In 2019, a study involved evaluating sleep quality in patients referred for aesthetic rhinoplasty. Among the 44 patients with nasal obstruction conditions examined, 29 had a nasal septal deviation. It was found that 26 of these patients had poor sleep quality [9]. A study conducted in 2023 involved 90 patients with a nasal septal deviation. It was a comparative study to determine if correcting the septum would improve life parameters, including sleep quality. Patients were classified based on the severity of nasal obstruction, and all groups had high PSQI scores before correction. After septoplasty, PSQI scores decreased, and sleep quality improved [10]. This research is needed because there is a significant lack of studies focusing on the quality of sleep in patients with nasal septal deviation especially in Saudi Arabia. Despite the common occurrence of this condition, its impact on sleep quality is not well understood. By investigating this relationship, we aim to fill this gap in knowledge, providing valuable insights that can improve patient care and treatment outcomes. Understanding how nasal septal deviation affects sleep can help guide clinical practices and enhance the overall quality of life for affected individuals.

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The main objective of this study was to determine the impact of nasal septal deviation on the quality of sleep among patients with deviated nasal septum in the Saudi population.

Methodology:

Study design and setting:

This cross-sectional survey. Data were collected and the study was carried out from July to December 2024 by using Google form which was disrupted by social media platforms with the Saudi population. The study's population consisted of Saudi NSD patients aged 18-65 who had not had nasal surgery or major intervention.

Sample size:

Data collection involved a target sample of 384 patients (confidence level: 95%; margin of error: 5%). The sample size was estimated using the formula:

n = P(1-P) * Zα 2 / d 2 with a 95% confidence level.

n: Calculated sample size.

Z: The z-value for the selected confidence level (1- a) = 1.96.

P: An estimated prevalence of the population with the characteristic of interest.

Q: (1 – 0.50) = 50%, i.e., 0.50.

D: The maximum acceptable error = 0.05.

Therefore, the calculated minimum sample size was n = (1.96)2 X 0.50 X 0.50/(0.05) 2 = 384.

Inclusion and Exclusion Criteria:

Participants was including adults aged 18-65 with diagnosed nasal septal deviation in Saudi Arabia who are willing to undergo sleep quality assessments and have not had nasal surgery or major interventions to ensure the deviation's effects are not influenced by recent surgical changes, and who provide informed consent. Exclusion criteria was apply to individuals with other sleep disorders (OSA, insomnia), prior nasal surgery, other nasal conditions (chronic rhinosinusitis or nasal polyps), severe chronic illnesses, those on medications affecting sleep, or individuals who refuse to participate.

Method for data collection, instrument and score system:

In our study we utilized two well-established self-report instruments to collect the data - the Pittsburgh Sleep Quality Index (PSQI) and the Nasal Obstruction Symptom Evaluation (NOSE) scale. Both the PSQI and NOSE scales have been successfully translated into Arabic, enabling their use and evaluation among Arabic-speaking populations.

The PSQI we used to be a widely adopted measure of self-reported sleep quality and disturbances. It consists of 19 individual items that assess various components of sleep over the past month, including sleep duration, sleep latency, sleep efficiency, sleep disturbances, use of sleeping medication, and daytime dysfunction. These 19 items are combined to produce seven component scores, each weighted

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equally on a 0-3 scale. The seven component scores are then summed to generate a global PSQI score ranging from 0 to 21, with higher scores indicating poorer sleep quality. A global PSQI score greater than 5 is generally used to identify individuals with poor sleep quality[11–13].

The NOSE scale we used is a validated instrument for assessing nasal obstruction symptoms. It comprises 5 items that evaluate nasal congestion, nasal blockage, trouble breathing through the nose, trouble sleeping, and inability to get enough air through the nose. Each item is scored on a 0-4 scale, with 0 indicating "not a problem" and 4 indicating a "severe problem". The five items scores are then summed to produce a total NOSE score ranging from 0 to 20, with higher scores indicating greater nasal obstruction [14,15].

Scoring system:

(PSQI) questionnaire: The Pittsburgh Sleep Quality Index (PSQI) consists of 19 self-reported questions and 5 questions scored by a sleeping partner or roommate (if available). just self-rated questions included in the scoring. The 19 self-rated elements are combined to provide seven "component" ratings, every component ranges from 0 to 3 points. In all circumstances, a "0" refers to no difficulty, whereas a "3" refers to severe difficulty. The components results are added to provide a "global" score with a range of 0 to 21 points, "0" representing no difficulty and "21" representing serious difficulties over all components.

(NOSE) scale: Nasal Obstruction Symptom Evaluation (NOSE) consists of 5 self-reported questions each question contains a 5-point Likert scale. The range of scores on the final instrument is 0 to 20. The score is then multiplied by 5 to obtain a total score ranging from 0 to 100. The findings are classified as having mild (5-25), moderate (30-50), severe (55-75), or extensive (80-100) nasal blockage. A score of zero indicates no nasal obstruction issues, while a score of 100 indicates the greatest nasal obstruction issues that could exist. The instrument was not intended to be used with personal patient information or to forecast a person's future.

Pilot test:

Twenty people were given the questionnaire and asked to complete it. This was done in order to assess the study's viability and the ease of use of the questionnaire. The pilot study's results were not included in the study's final analysis.

Analyzes and entry method:

The computer's "Microsoft Office Excel Software" (2016) for Windows program was used to enter data. After that, data was moved to be statistically analyzed using the Statistical Package of Social Science Software (SPSS) program, version 20 (IBM SPSS Statistics for Windows, Version 20.0. Armonk, NY: IBM Corp.). On a computer, collected data was input using the Windows version of Microsoft Excel (2016). After that, data was moved to version 20 of the Statistical Package for Social Science Software (SPSS). to be examined statistically.

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Results:

Table (1) displays various demographic parameters of the participants with a total number of (567). The data surveys an array of residential regions but has strong concentrations at 37.9 in the Central region and 32.3 in the Western region. The age distribution shows a relatively young group of participants, with a mean age of 28.7 years and 28.4% of respondents in their 25 to 30 age group. While a little male, 56.6%, gender representation is slightly more male gender; 67.2% identify as single. Notably, a large portion of participants, which earned less than 5,000 SAR/month, is high (51.3%). Importantly, every person in this sample (100%) admitted to having a diagnosis of nasal septal deviation, this was a very specific and targeted sample population specifically looking at this condition.

Table (1): Sociodemographic characteristics of participants (n=567)

Parameter		***No.***	***Percent (%)***
Nationality	Saudi	545	96.1
	Non-Saudi	22	3.9
Residential area	Northern region	81	14.3
	Southern region	46	8.1
	Central region	215	37.9
	Eastern region	42	7.4
	Western region	183	32.3
Age ***(Mean:28.7, STD:8.9)***	22 or less	110	19.4
	23 to 24	148	26.1
	25 to 30	161	28.4
	31 or more	148	26.1
Gender	Female	246	43.4
	Male	321	56.6
Marital status	Single	381	67.2
	Married	171	30.2
	Divorced	11	1.9
	Widowed	4	.7
Monthly income in SAR	Less than 5000	291	51.3
	5000-9999	109	19.2
	10,000-14,999	55	9.7
	15,000-19,999	59	10.4
	More than 20,000	53	9.3
Are you diagnosed with nasal septal deviation?	Yes	567	100.0
	No	0	0

As shown in figure 1, Our sample of 567 individuals provides insightful trends associated with past month bedtime preferences. There was a substantial majority, roughly 43 percent (or 247) who said they went to bed between 12 AM and two AM, making it the most common bedtime range. On the contrary, 25% (140 people) preferred that they retire between 8 PM and 12 AM, while that is important, it indicates a lesser inclination for early retirement. About 13 percent of the sample, or 75 people, had opted to sleep between 2 AM and 6 AM, which constituted a group that was engaging in a particularly late sort of sleeping habits. One item to mention is that 18% (105 people) reported sleeping past 6 AM, a trend that some individuals seem to have of keeping very irregular sleep schedules.

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Figure (1): Illustrates time of sleep in the last month among participants.

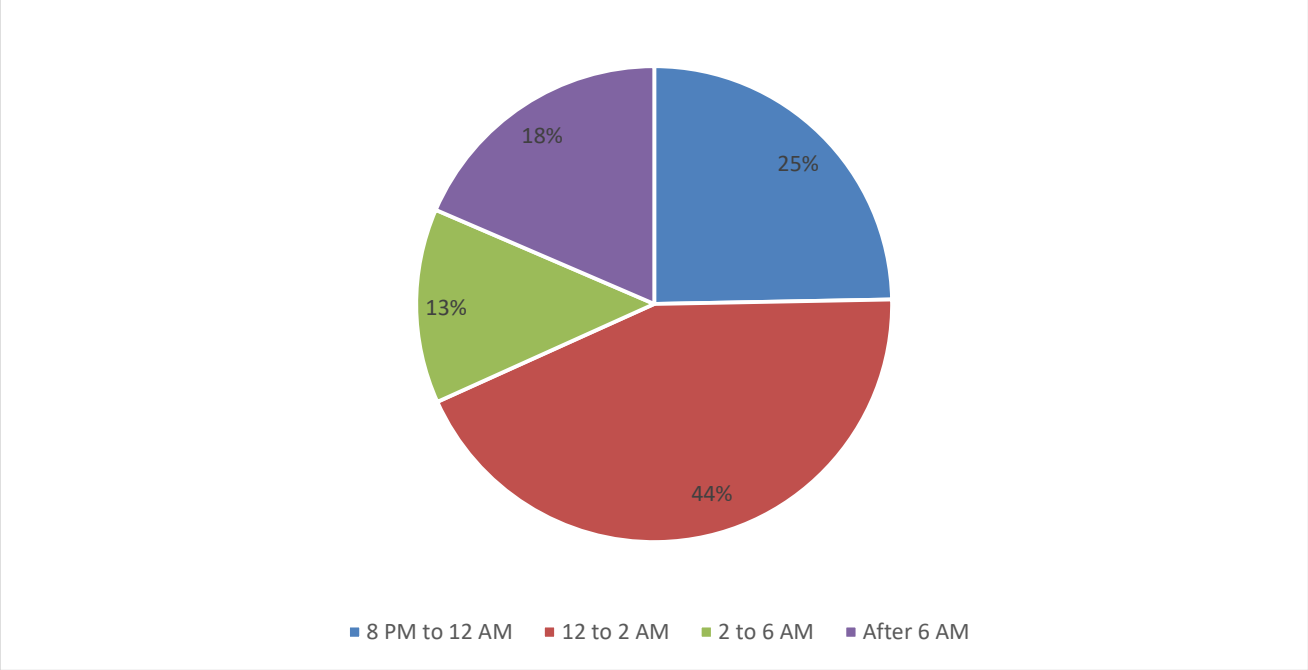

Table 2, illustrated above, presents the full scope of possible nasal obstruction severity and its relation to sleep patterns among a sample of 567 participants. The data shows there is an abundance of nasal congestion; 28 percent had moderate congestion, 31.4 have very mild congestion, suggesting a severity of symptoms for which more research is warranted. Of note, 11.3% of respondents indicated that their nasal blockage was severe, and an additional high 32.5% reported moderate obstruction, indicating that nasal flow issues are common and potentially clinically important to the overall quality of life. Furthermore, the sleep duration and onset data reveal that many people have difficulty in initiating sleep, having to spend 16 to 30 minutes to fall asleep (corresponding to 34.4 % of the population). What's interesting is that 49.6 percent of the participants said they got seven or more hours of sleep.

Table (2): Parameters related to nasal obstruction severity evaluation -NOSE- and sleep time and duration (n=567).

Parameter		***No.***	***Percent (%)***
Nasal congestion / stiffness	Severe problem	25	4.4
	Fairly bad problem	92	16.2
	Moderate problem	159	28.0
	Very mild problem	178	31.4
	Not a problem	113	19.9
Nasal blockage / obstruction	Severe problem	64	11.3
	Fairly bad problem	145	25.6
	Moderate problem	184	32.5
	Very mild problem	120	21.2
	Not a problem	54	9.5
Trouble breathing by the nose	Severe problem	48	8.5

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	Fairly bad problem	132	23.3
	Moderate problem	160	28.2
	Very mild problem	153	27.0
	Not a problem	74	13.1
Trouble sleeping	Severe problem	71	12.5
	Fairly bad problem	117	20.6
	Moderate problem	159	28.0
	Very mild problem	131	23.1
	Not a problem	89	15.7
Not getting enough breath via my nose during exercise or effort	Severe problem	73	12.9
	Fairly bad problem	152	26.8
	Moderate problem	122	21.5
	Very mild problem	142	25.0
	Not a problem	78	13.8
When did you normally go to bed over the last month?	8 PM to 12 AM	140	24.7
	12 to 2 AM	247	43.6
	2 to 6 AM	75	13.2
	After 6 AM	105	18.5
How long (in minutes) would it take you to fall asleep every night during the last month?	0 to 15 mins	145	25.6
	16 to 30 mins	195	34.4
	31 to 60 mins	156	27.5
	More than 60 mins	71	12.5
When did you typically get up in the morning over the last month?	Before 6 AM	133	23.5
	6 to 7 AM	123	21.7
	7 to 9 AM	140	24.7
	9 to 11 AM	77	13.6
	After 11 AM	94	16.6
How many hours of sleep did you get per night over the last month?	Less than 5	88	15.5
	5 to less than 6	95	16.8
	6 to less than 7	103	18.2
	7 or more	281	49.6

As shown in figure (2), It is shown that the data presented here offers important insights into the sleep patterns of the surveyed population, in general, who were surveyed in a total sample of 567 individuals. 19.2% (109 participants) indicated that they experienced some difficulty falling asleep in less than 30 minutes less than once a week and, hence, showed a fairly low prevalence of sleep onset problems. On the contrary, a larger proportion of population (39.2%, 222 people) suggested that they had experienced this challenge three or more per week which indicates the prevalence of sleep disturbances in population is considerable. Moreover, 20.6 percent (117 respondents) felt they did not have such problems at all over the past month, showing a group of people who sleep better. Together, these last two parts indicate that approximately 21.0% (119 participants) experienced trouble sleeping 1–2 times a week, or occasionally, rather than chronically.

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Figure (2): Illustrates whether participants can't fall asleep within 30 minutes.

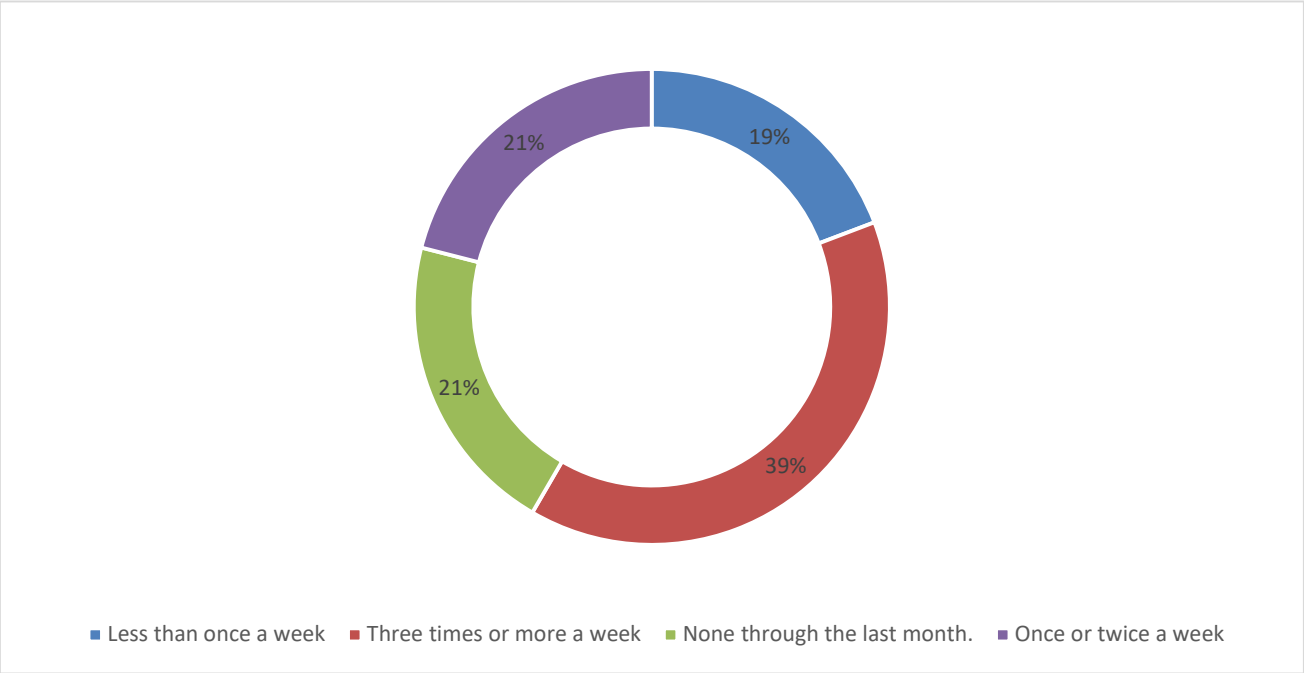

Table 3 presents an overall picture of the sleep quality and associated problems, as reflected, for example, in the Pittsburgh Sleep Quality Index (PSQI), among 567 participants. Importantly, many respondents (39.2%) said they struggle to fall asleep three times or more a week. In fact, 35.8% said they also woke up in the middle of the night or first thing in the morning at the same rate. Nocturnal awakenings for rest room use or discomfort in respiration are yet another example of the multisegmented nature of sleep disturbances in this cohort. That's alarming: 22.2% of participants said they experience sleep-related problems three or more times a week, and a significant portion (16.8%) score their overall sleep quality bad. The results also indicate dependency on sleep medication with 17.1 percent of respondents using them fewer than once per week indicating the sleep problems' impact on daily functions and a general well-being.

Table (3): Participants' Pittsburgh sleep quality index -PSQI- (n=567).

Parameter		***No.***	***Percent (%)***
Cannot fall asleep within 30 minutes	Less than once a week	109	19.2
	Three times or more a week	222	39.2
	None through the last month.	117	20.6
	Once or twice a week	119	21.0
Get up in the middle of the night or early morning.	Less than once a week	120	21.2
	Three times or more a week	203	35.8
	None through the last month.	107	18.9
	Once or twice a week	137	24.2
Wake up to use the restroom.	Less than once a week	131	23.1
	Three times or more a week	130	22.9

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	None through the last month.	165	29.1
	Once or twice a week	141	24.9
Unable to breathe comfortably.	Less than once a week	155	27.3
	Three times or more a week	183	32.3
	None through the last month.	102	18.0
	Once or twice a week	127	22.4
Cough or snore loudly	Less than once a week	142	25.0
	Three times or more a week	129	22.8
	None through the last month.	227	40.0
	Once or twice a week	69	12.2
Feeling cold	Less than once a week	162	28.6
	Three times or more a week	105	18.5
	None through the last month.	172	30.3
	Once or twice a week	128	22.6
Feeling hot	Less than once a week	154	27.2
	Three times or more a week	114	20.1
	None through the last month.	172	30.3
	Once or twice a week	127	22.4
Having nightmares.	Less than once a week	175	30.9
	Three times or more a week	88	15.5
	None through the last month.	194	34.2
	Once or twice a week	110	19.4
Having pain	Less than once a week	117	20.6
	Three times or more a week	74	13.1
	None through the last month.	255	45.0
	Once or twice a week	121	21.3
How many times in the last month have you had problems to sleep as a result of this? (n=410)	Less than once a week	64	15.6
	Three times or more a week	91	22.2
	None through the last month.	152	37.1
	Once or twice a week	103	25.1
Over the last month, how would you evaluate your overall sleep quality?	Very good	76	13.4
	Fairly good	307	54.1
	Fairly bad	95	16.8
	Very bad	89	15.7
How many times in the last month have you taken medications for sleep (prescription or "over the counter")?	Less than once a week	97	17.1
	Three times or more a week	54	9.5
	None through the last month.	362	63.8
	Once or twice a week	54	9.5
How frequently have you struggled to remain awake while driving, eating, or participating in social activities in the last month?	Less than once a week	162	28.6
	Three times or more a week	60	10.6
	None through the last month.	289	51.0
	Once or twice a week	56	9.9
How difficult has it been for you to maintain your motivation to complete	No problem at all	134	23.6
	Only a minor problem	213	37.6

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tasks throughout the last month?	Somewhat of a problem	159	28.0
	A serious problem	61	10.8

Table 4 presents a detailed survey of sleep disturbances documented in relation to bed partners or roommate by a sample size of 567 individuals. Moreover, 37.4% of the participants slept in the same bed with their partner, 30.7% slept in the same room but separately. A large portion of respondents (46.3%) reported no loud snoring during the past month, while 21.4% reported loud snoring three times or more on a weekly basis. Moreover, regarding breathing interruptions, 53.4% declared that there were none, indicating maybe an association between sleep environment and sleep quality.

Table (4): participants' PSQI regarding partner complaint (n=567).

Parameter		***No.***	***Percent (%)***
Do you have a bed partner or roommate?	No bed partner or roommate	146	25.7
	Partner/roommate in other room	35	6.2
	Partner in same room but not on same bed.	174	30.7
	Partner in same bed	212	37.4
Ask your roommate or bed partner how frequently you have had loud snoring in the last month if you have one (n=421)	Less than once a week	90	21.4
	Three times or more a week	90	21.4
	None through the last month.	195	46.3
	Once or twice a week	46	10.9
Ask your roommate or bed partner how frequently you have had long stops within breaths during sleeping in the last month if you have one (n=421)	Less than once a week	92	21.9
	Three times or more a week	50	11.9
	None through the last month.	225	53.4
	Once or twice a week	54	12.8
Ask your roommate or bed partner how frequently you have had legs twitching or jerking during sleep in the last month if you have one (n=421)	Less than once a week	89	21.1
	Three times or more a week	68	16.2
	None through the last month.	185	43.9
	Once or twice a week	79	18.8
Ask your roommate or bed partner how frequently you have had disorientation or confusion when sleeping in the last month if you have one (n=421)	Less than once a week	100	23.8
	Three times or more a week	51	12.1
	None through the last month.	201	47.7
	Once or twice a week	69	16.4
How often during the past month you have this? (n=338)	Less than once a week	85	25.1
	Three times or more a week	39	11.5
	None through the last month.	166	49.1
	Once or twice a week	48	14.2

Table 5 presents some interesting insights obtained from the data on the surveyed population with regards to sleep quality. In particular, an extremely large unexposed majority, 84.5% of respondents, had very poor sleep quality, which suggests problems that can potentially affect general health and wellness. But, compared with only 15.5 of you who rated your own sleep quality as good, that means a lot of people might be dealing with issues around their sleep.

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Table (5): Shows PSQI levels score results.

	Frequency	**Percent**
Good sleep quality	88	15.5
Poor sleep quality	479	84.5
Total	567	100.0

Table 6 meticulously presents frequency and percentage of different levels of nasal blockage as measured by Nasal Obstruction Symptom Evaluation (NOSE) scores in a total of 567 respondents. A noteworthy observation, which is that the majority of them reported moderate nasal blockage (36.0%) or severe nasal blockage (31.0%) which suggests that there was considerable discomfort in this cohort of participants. The contribution of 67.0% (severe and moderate) to combined figures for severity and the importance of arterial blockage severe enough to require clinical intervention, again highlights the importance of significant nasal obstruction. On the other hand, lower frequencies of 23.5% and 9.5% reported mild and extensive nasal blockage, respectively.

Table (6): Shows NOSE levels score results.

	Frequency	**Percent**
Extensive nasal blockage	54	9.5
Severe nasal blockage	176	31.0
Moderate nasal blockage	204	36.0
Mild nasal blockage	133	23.5
Total	567	100.0

Table (7) shows that sleep quality has statistically significant relation to age (P value=0.0001), gender (P value=0.032), and monthly income in SAR (P value=0.0001). It also shows statistically insignificant relation to nationality, residential region, and marital status. Participants aged 23 to 24, of male gender, and who have monthly income less than 5000 SAR had better quality of sleep.

Table (7): Relation between PSQI and sociodemographic characteristics.

Parameters		***PSQI***		***Total (N=567)***	***P value****
		Good sleep quality	**Poor sleep quality**		
Nationality	Saudi	83	462	545	0.341
		94.3%	96.5%	96.1%	
	Non-Saudi	5	17	22	
		5.7%	3.5%	3.9%	
Age	22 or less	25	85	110	0.0001
		28.4%	17.7%	19.4%	
	23 to 24	36	112	148	
		40.9%	23.4%	26.1%	
	25 to 30	17	144	161	
		19.3%	30.1%	28.4%	

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	31 or more	10	138	148	
		11.4%	28.8%	26.1%	
Residential region	Northern region	15	66	81	0.288
		17.0%	13.8%	14.3%	
	Southern region	4	42	46	
		4.5%	8.8%	8.1%	
	Central region	34	181	215	
		38.6%	37.8%	37.9%	
	Eastern region	3	39	42	
		3.4%	8.1%	7.4%	
	Western region	32	151	183	
		36.4%	31.5%	32.3%	
Gender	Female	29	217	246	0.032
		33.0%	45.3%	43.4%	
	Male	59	262	321	
		67.0%	54.7%	56.6%	
Marital status	Single	62	319	381	0.402
		70.5%	66.6%	67.2%	
	Married	26	145	171	
		29.5%	30.3%	30.2%	
	Divorced	0	11	11	
		0.0%	2.3%	1.9%	
	Widowed	0	4	4	
		0.0%	0.8%	0.7%	
Monthly income in SAR	Less than 5000	64	227	291	0.0001
		72.7%	47.4%	51.3%	
	5000 to 9999	3	106	109	
		3.4%	22.1%	19.2%	
	10000 to 14999	10	45	55	
		11.4%	9.4%	9.7%	
	15000 to 19999	8	51	59	
		9.1%	10.6%	10.4%	
	More than 20000	3	50	53	
		3.4%	10.4%	9.3%	

****P value was considered significant if ≤ 0.05.***

Table (8) shows that nasal blockage has statistically significant relation to age (P value=0.002), residential region (P value=0.024), and monthly income in SAR (P value=0.0001). It also shows statistically insignificant relation to nationality, gender, and marital status. Participants aged 31 or more, residing in central region, and who have monthly income between 5000 SAR to 10000 had more extensive nasal blockage.

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Table (8): Nasal blockage in association with sociodemographic characteristics.

Parameters		***Nasal blockage***		***Total (N=567)***	***P value****
		Extensive to severe nasal blockage	**Mild to moderate nasal blockage**		
Nationality	Saudi	220	325	545	0.634
		95.7%	96.4%	96.1%	
	Non-Saudi	10	12	22	
		4.3%	3.6%	3.9%	
Age	22 or less	44	66	110	0.002
		19.1%	19.6%	19.4%	
	23 to 24	42	106	148	
		18.3%	31.5%	26.1%	
	25 to 30	71	90	161	
		30.9%	26.7%	28.4%	
	31 or more	73	75	148	
		31.7%	22.3%	26.1%	
Residential region	Northern region	27	54	81	0.024
		11.7%	16.0%	14.3%	
	Southern region	11	35	46	
		4.8%	10.4%	8.1%	
	Central region	101	114	215	
		43.9%	33.8%	37.9%	
	Eastern region	19	23	42	
		8.3%	6.8%	7.4%	
	Western region	72	111	183	
		31.3%	32.9%	32.3%	
Gender	Female	99	147	246	0.892
		43.0%	43.6%	43.4%	
	Male	131	190	321	
		57.0%	56.4%	56.6%	
Marital status	Single	156	225	381	0.052
		67.8%	66.8%	67.2%	
	Married	66	105	171	
		28.7%	31.2%	30.2%	
	Divorced	8	3	11	
		3.5%	0.9%	1.9%	
	Widowed	0	4	4	
		0.0%	1.2%	0.7%	
Monthly income in SAR	Less than 5000	93	198	291	0.0001
		40.4%	58.8%	51.3%	
	5000 to 9999	66	43	109	
		28.7%	12.8%	19.2%	
	10000 to	26	29	55	

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	14999	11.3%	8.6%	9.7%	
	15000 to 19999	20	39	59	
		8.7%	11.6%	10.4%	
	More than 20000	25	28	53	
		10.9%	8.3%	9.3%	

P value was considered significant if ≤ 0.05.

Discussion:

The present study aimed to evaluate the effect of nasal septal deviation (NSD) on sleep quality in Saudi patients. In particular, given the high prevalence of NSD, this investigation is highly relevant. This study's findings contribute to the literature now growing on the association between nasal obstruction, notably on the basis of NSD, and poor sleep quality. Results suggest that there was a huge prevalence of poor sleep quality indicated by high Pittsburgh Sleep Quality Index (PSQI) scores as well as a high correlation between nasal obstructions severity and the sleep disturbances. The findings are consistent with previous research showing a strong relationship between nasal obstruction and sleep-related disorders, including obstructive sleep apnea (OSA) and others.

In accordance with the findings of the present study, Friedman et al. [16] found that nasal resistance is increased by nasal obstruction, which can result in sleep disordered breathing events (apneas and hypopneas), worsening the quality of sleep. Likewise, Kim et al. mentioned that normal sleep quality was dependent on ideal airway resistance and any obstruction in the nasal breathing pathway can badly affect the sleep quality [17]. Results of the current study, which indicate that a substantial percent of participants had trouble falling asleep and nocturnal awakenings are consistent with the conclusions of Giri and Salud who reported that patients with chronic nasal obstruction had a significant number of reported sleep disturbances [18]. These findings are further in accord with data from Udaka et al. that has demonstrated a correlation between nasal obstruction severity and daytime sleepiness and thus emphasizes the negative influences of nasal obstruction on daytime as well as nighttime sleep quality.

However, the demographic analysis done in the current study also showed that people who are younger, such as those who are 23 to 24 years old have better sleep quality, which is similar with Rhee et al. [20]. Their study found that young people who are asked about sleep disturbances report their problems less severe than those of older adults due to their more severe nasal obstruction and its concomitant problems. But this demographic insight is highly important, giving us insight into the specific need to target specific interventions that consider the age related differences in the sleep quality and the severity of the nasal obstruction.

As well, the current study also noted that a large percentage of individuals in this group relied on use of sleep medications, suggesting the severity of sleep disturbances present in those with NSD. The work of Koutsourelakis et al. confirms this finding in that patients with nasal obstruction often use pharmacological intervention to treat their sleep related problems [21]. Using sleep medications is a signal for a broader trend among people with nasal obstruction who want to ease their discomfort. Additionally, the high prevalence of reported snoring among participants is consistent with study in which Lofaso et al. reported a high association between nasal obstruction and the occurrence of snoring, a common symptom of sleep disordered breathing [22].

Limitations of the current study are its small sample size and its cross-sectional nature, such that a causal relationship could not be established. Limiting causality between nasal obstruction and sleep

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disturbances, this study used a cross-sectional design. Furthermore, the use of self reported measures (PSQI and NOSE scales) may subject this study to bias since people themselves may not always misreport their perceived sleep quality and nasal obstruction which are markedly different than objectively measured severity. Important future work would be to include objective measures of quality of sleep, such as polysomnography, in future longitudinal studies to more fully understand the effect of NSD on sleep quality.

Conclusion:
This study highlights the sensitivity of patients in Saudi Arabia sleep quality to nasal septal deviation. This demonstrates the prevalence of sleep disturbances in NSD, with elevated PSQI scores and correlation to nasal obstruction severity indicating a comprehensive reviews and interventions are needed in patients with NSD. These findings are supported by the existing literature in the space which highlights the critical nature of treating nasal obstruction to improve sleep quality and quality of life more broadly. Future research will examine how irritation from nasal obstruction, which creates sleep disturbances, may occur and if so, benefits of surgical interventions to relieve these problems should be also explored.

Acknowledgement:

We acknowledge all of the volunteers who provided samples for this research.

Ethical approval:

After fully explaining the study and emphasizing that participation is optional, each participant gave their informed consent. The information gathered was safely stored and utilized exclusively for study.

Funding:

This study was not supported by any outside sources.

Conflict of interests:

The authors declare no conflict of interest.

Informed consent:

Written informed consent was acquired from each individual study participant.

Data and materials availability:

All data associated with this study are present in the paper.

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