Association Between Blood Donation and Improved Sleep Quality Among Blood Donors in Aseer Region

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Received: September 2022 Accepted: October 2022; Published: November 1, 2022.
Citation: Mohammed Abdulrahman Alshibli et al. Association Between Blood Donation and Improved Sleep Quality Among Blood Donors in Aseer Region. World Family Medicine. 2022; 20(11): 100-108. DOI: 10.5742/MEWFM.2022.95251366

Abstract

Background: High altitude like Aseer region has many challenges, where exposure to hypoxia is the most reported challenge. The ambient hypoxia activates a number of physiologic consequences including hyperventilation, increased resting heart rate and stimulation of erythrocyte production with the goal of preserving the oxygen content of arterial blood at or above sea level values.

Aim: The current study aims to assess the association between blood donation and improved sleep quality among blood donors in Aseer Region, southern of Saudi Arabia.

Methods: A cross-sectional study was carried out using self-administered questionnaire during the period from May to August 2022 targeting all Saudi population aged 18 years or more living in Aseer region. The study questionnaire was uploaded online using social media platforms by the researchers and their colleagues till no more answers were obtained. The study questionnaire included participants' personal data, medical history, blood donation data including frequency, causes and associated symptoms. Sleep quality was assessed using Pittsburgh Sleep Quality Index (PSQI).

Results: A total of 447 participants fulfilling the inclusion criteria completed the study questionnaire. Participants ages ranged from 18 to 60 years with mean age of 26.9 ± 12.7 years old. A total of 215 (48.1%) participants reported donating blood which was only once among 68 (31.6%), and 2-3 times among 82 (38.1%). Regarding overall sleep quality among blood donors in Aseer region, Saudi Arabia, exactly 116 (54%) of the study participants with blood donation history were poor sleepers while 99 (46%) were good sleepers. Better sleep quality was significantly associated with more frequent blood donation times.

Conclusion: In conclusion, the current study showed that sleep quality among Aseer residents after blood donation was much lower than reported incidence especially among participants who donated blood more than once. Also, the attitude toward blood donation was good where nearly 1 out of each 2 participants donated blood for moral issues.

Key words
Blood donation, sleep hygiene, relation, Aseer region, high altitude

Introduction

Sleep disturbance is a frequent and mostly underestimated complaint in the general population [1], which can persist over many years [2] and which is associated with many health problems, higher functional impairment, lost productivity, and excess health care utilization [3-5]. It a challenge to treat sleep-related problems with limited abilities [6], though, insomnia can be a symptom of other conditions, such as depression [7], substance abuse [8], and sleep disordered breathing [9]. Currently, the term "primary insomnia" is used to define insomnia in the absence of such conditions [10].

High altitude areas like Aseer region have many challenges, where exposure to hypoxia is the most reported challenge [11]. The ambient hypoxia activates a number of physiologic consequences including hyperventilation, increased resting heart rate and stimulation of erythrocyte production with the goal of preserving the oxygen content of arterial blood at or above sea level values [12]. In permanent high-altitude residents due to exposure to chronic hypoxia, an increase in erythrocyte numbers and hemoglobin concentration is reported [13].

In the current study, researchers tried to link the effect of blood donation on the sleep quality of high-altitude residents. Blood donation is life saving and has a lot of benefit for the donor and recipient especially in life saving condition and trauma settings. For example Health services could not operate without a continual supply of blood. For management of diseases such as sickle cell and thalassemia however some research reports negative and positive effects of blood donation on the donor. Some of the negative effects include long-term iron deficiency anemia while on the other hand some blood donation positive effects include reduced mortality and reduced risk of myocardial infarction [14-16].

Methodology

A cross-sectional study was carried out using self-administered questionnaire during the period from May to August 2022targeting all Saudi population aged 18 years or more living in Aseer region for at least 6 months. The study questionnaire was developed by the researchers after intensive literature review and experts' consultation. A panel of 3 experts at King Khalid University reviewed the study questionnaire and all suggested modifications were applied. The ultimate questionnaire was uploaded online using social media platforms by the researchers and their colleagues till no more answers were obtained. Participants with a history of mental illness, neurologic diseases and less than 18 years were excluded. The study questionnaire included participants' personal data, medical history, blood donation data including frequency, causes and associated symptoms. Sleep quality was assessed using Pittsburgh Sleep Quality Index (PSQI) and other questions related to sleep quality [17]. A pilot study of 30 persons was used to assess the questionnaire reliability with estimated α-Cronbach's of 0.81.

Data analysis

After data was extracted, it was revised, coded, and fed to statistical software IBM SPSS version 22(SPSS, Inc. Chicago, IL). All statistical analysis was done using two tailed tests. P value less than 0.05 was statistically significant. Descriptive analysis based on frequency and percent distribution was done for all variables including participants personal data, medical data, blood donation and associated symptoms. The global score for PSQI was obtained by summing up all items' discrete scores of its seven "component" scores: subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medication, and daytime dysfunction. The sum of scores for these seven components yields one global score. In scoring the PSQI, seven component scores are derived, each scored 0 (no difficulty) to 3 (severe difficulty). The component scores are summed to produce a global score (range 0 to 21). Higher scores indicate worse sleep quality. Tool reliability was assessed using alpha Cronbach's coefficient which reflects the tool internal consistency. Internal consistency reliability of 0.7 or more is judged good [14]. Total score was categorized at cut off point 7 as those who had a global score of 7 points or less were considered to have good sleep quality (good sleepers) while others with a global score of more than 7 points were considered to have moderate to poor sleep quality (poor sleepers). Crosstabulation was used to assess distribution of blood donors' sleep quality by their personal and other related data. Significance of relations in cross tabulation was tested using Pearson chi-square test and exact probability test for small frequency distributions.

Results

A total of 447 participants fulfilling the inclusion criteria completed the study questionnaire. Participants' ages ranged from 18 to 60 years with mean age of 26.9 ± 12.7 years old. A total of 337 (75.4%) participants were males and 327 (73.2%) were in the city. Exactly 291 (65.1%) were single / divorced. As for educational level, 375 (83.9%) had university level of education or above. A total of 210 (47%) were health care professionals and 341 (76.3%) were non-smokers while 85 (19%) were current smokers. Exactly 55 (12.3%) complained of a chronic health problem (Table 1).

Table 1. Bio-demographic data of study participants, Aseer region, Saudi Arabia

Bio-demographic data	No	%
Age in years		
< 30	302	67.6%
30-39	71	15.9%
40+	74	16.6%
Gender		
Male	337	75.4%
Female	110	24.6%
Living in		
City	327	73.2%
Village	120	26.8%
Marital status		
Unmarried	291	65.1%
Married	156	34.9%
Educational level		
Secondary / below	72	16.1%
University/ above	375	83.9%
Career		
Health care worker	210	47.0%
Non-health care worker	237	53.0%
Smoking		
Current smoker	85	19.0%
Non-smoker	341	76.3%
Ex-smoker	21	4.7%
Do you suffer from any chronic disease?		
Yes	55	12.3%
No	392	87.7%

Table 2. Blood donation data among study participants, Aseer region, Saudi Arabia.

Blood donation data	No	%
Have you ever donated blood?		
Yes	215	48.1%
No	232	51.9%
If Yes how many times? (n=215)		
Once	68	31.6%
2-3	82	38.1%
4-5	23	10.7%
> 5	42	19.5%
If you donated more than once. How many times have you donated blood in last year?		
Once	59	40.1%
2 times	21	14.3%
3 times	7	4.8%
4+	60	40.8%
Why have you donated blood (n=215)		
Voluntary	148	68.8%
Humanity duty	98	45.6%
For my health	78	36.3%
For family and friends	50	23.3%
National duty	49	22.8%
I have rare blood type	15	7.0%
Symptoms after blood donation (n=215)		
None	161	74.9%
Dizziness	42	19.5%
Nausea	11	5.1%
Sweating	10	4.7%
Weakness	8	3.7%
Discomfort	7	3.3%
Fainting	6	2.8%
Pallor	6	2.8%
Bruising	6	2.8%
Vomiting	4	1.9%

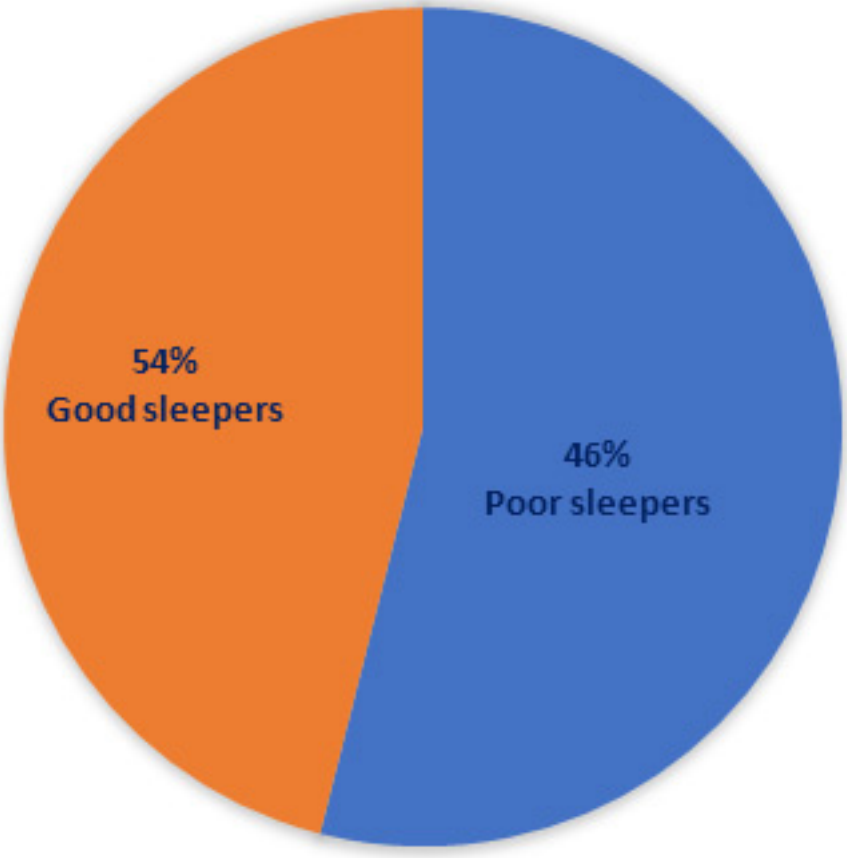
A total of 215 (48.1%) participants reported donating blood which was for only once among 68 (31.6%), 2-3 times among 82 (38.1%) and more than 5 times among 42 (19.5%). As for reported reasons for blood donation, the most reported were voluntary donation (68.8%), for humanity duty (45.6%), for health issue (36.3%), for family / friends (23.3%) while 7% donate as they had a rare blood group. A total of 19.5% of the blood donors felt dizziness after donation while nausea was reported among 5.1% and sweating among 4.7% while 161 (74.9%) had no associated symptoms.

Table 3. Blood intake among study participants, Aseer region, Saudi Arabia.

Blood intake	No	%
Did you receive blood before?		
Yes	35	7.8%
No	412	92.2%
If yes, why?		
Surgery	24	68.6%
Severe iron deficiency anemia	8	22.9%
Other blood disease	1	2.9%
Hemorrhage	2	5.7%

A total of 35 (7.8%) participants reported previously having a blood transfusion. The main reported causes were surgery (68.6%), severe iron deficiency anemia (22.9%), other blood diseases (2.9%), and hemorrhage (5.7%).

Figure 1. Overall sleep quality among blood donors in Aseer region, Saudi Arabia



Overall sleep quality among blood donors in Aseer region, Saudi Arabia. Exactly 116 (54%) of the study participants with blood donation history were poor sleepers while 99 (46%) were good sleepers.

Table 4. Sleep quality components among study participants who donated blood, Aseer region, Saudi Arabia.

Sleep quality components (n=215)	No	%
Subjective sleep quality		
Very good	67	31.2%
Fairly good	105	48.8%
Fairly bad	31	14.4%
Very bad	12	5.6%
Sleep latency		
Very good	50	23.3%
Fairly good	86	40.0%
Fairly bad	53	24.7%
Very bad	26	12.1%
Sleep duration		
> 7 hours	28	13.0%
6-7 hours	148	68.8%
5-6 hours	31	14.4%
< 5 hours	8	3.7%
Habitual sleep efficiency		
> 85%	37	17.2%
75-84%	139	64.7%
65-74%	27	12.6%
< 65%	12	5.6%
Sleep disturbances		
Very low	54	25.1%
Fairly low	116	54.0%
Fairly high	39	18.1%
Very high	6	2.8%
Use of sleeping medication		
Not during donation	173	80.5%
Less than once	24	11.2%
Once or twice	11	5.1%
Three or more times	7	3.3%
Daytime dysfunction		
Very low	99	46.0%
Fairly low	80	37.2%
Fairly high	30	14.0%
Very high	6	2.8%

Regarding subjective sleep quality, it was bad among 20% of the study patients . Sleep latency was also bad among 36.8% of the donors, and only 13% sleep more than 7 hours. Habitual sleep efficiency was less than 85% among 82.8% of the study participants and 20.9% had high sleep disturbance score with 16.8% having high level of daytime dysfunction. Global PSQI score ranged from 0-17 with mean score of 6.4 ± 3.5 points.

Table 5. Factors associated with sleep quality among blood donors in Aseer region, Saudi Arabia

Factors	Sleep hygiene				p-value
	Poor sleepers		Good sleepers		
	No	%	No	%	
Age in years					
< 30	67	54.0%	57	46.0%	.134
30-39	29	64.4%	16	35.6%	
40+	20	43.5%	26	56.5%	
Gender					
Male	106	53.3%	93	46.7%	.476
Female	10	62.5%	6	37.5%	
Living in					
City	81	50.3%	80	49.7%	.049*
Village	35	64.8%	19	35.2%	
Marital status					
Unmarried	68	54.8%	56	45.2%	.761
Married	48	52.7%	43	47.3%	
Educational level					
Secondary / below	19	50.0%	19	50.0%	.590
University/ above	97	54.8%	80	45.2%	
Career					
Health care worker	52	57.1%	39	42.9%	.422
Non-health care worker	64	51.6%	60	48.4%	
Smoking					
Current smoker	40	61.5%	25	38.5%	.321
Non-smoker	70	51.1%	67	48.9%	
Ex-smoker	6	46.2%	7	53.8%	
Do you suffer from any chronic disease?					.373
Yes	15	62.5%	9	37.5%	
No	101	52.9%	90	47.1%	
If Yes how many times?					
Once	61	89.7%	7	10.3%	
2-3	55	67.1%	27	32.9%	.001*
4-5	0	0.0%	23	100.0%	
> 5	0	0.0%	42	100.0%	
If you donated more than once. How many times have you donated blood in last year?					
Once	21	35.6%	38	64.4%	.047*$
2 times	4	19.0%	17	81.0%	
3 times	1	14.3%	6	85.7%	
4+	29	48.3%	31	51.7%	
Did you receive blood before?					.994
Yes	7	53.8%	6	46.2%	
No	109	54.0%	93	46.0%	

Exactly 49.7% of blood donors who live in the city had good sleep quality after donation compared to 35.2% of others who live in a village with reported statistical significance (P=.049). Also, all donors who donated blood for 4 times or more were good sleepers versus 10.3% of others who donated once (P=.001). Additionally, 85.7% of those who donated blood 3 times during the last year were good sleepers in comparison to 64.4% of others who donated only once (P=.047).

Discussion

Residents at high altitude regularly experience sleep disturbances, frequently reporting restless and sleepless nights. Others experience a feeling of suffocation on awakening from sleep. Subjective reports have shown poor sleep as altitude increases, signifying an inverse relationship between sleeping at altitude and sleep quality [18, 19]. A characteristic waxing and waning breathing pattern known as periodic breathing accompanies sleep at high altitude. Periodic breathing during sleep was first described by Mosso in 1886 [20, 21] with further observations a few years later by Douglas and colleagues [22, 23]. This article will review high altitude sleep, focusing on sleep architecture, sleep continuity, arterial oxygen saturation, and on periodic breathing during sleep.

Recently, blood donor health care has been a major concern. It is vital to maintain a healthy, satisfied, and reliable donor population and is consequently highly ranked in blood bank settings globally. Adverse effects such as dizziness, fatigue, and vasovagal reactions are proven causes of donor deferral and therefore, are still of high focus and attention to health care authorities [24, 25]. The focus on adverse effects and how to avoid them have led to the implementation of standard procedures to limit negative side effects of donation worldwide [26, 27].

The current study aimed to assess the association between blood donation and improved sleep quality among blood donors in Aseer Region, southern Saudi Arabia. The study results showed that nearly half of the study participants donated blood mainly 1 to 3 times while some cases donated blood more than 5 times. The main reasons were moral issues including voluntary donation, humanity, families and friends' need but also about one third of the donors did it for their own health. Gader AG et al [28] assessed that 91% of Saudi participants agree that blood donation is a religious obligation, 34% do not object to donating six times/year and 67% did not mind coming to the donor center to give blood.

Non-donors: Forty-six percent were not asked to give blood and those who were asked mentioned fear (5%) and lack of time (16%) as their main deterrents. On the other hand, a study in Nigeria [29] estimated that 20.3% of the study population would not donate blood, and curiously enough, will not accept blood transfusion due mainly to religious beliefs; a situation reminiscent of the behavior of Jehovah's witnesses [30, 31].

Regarding sleep quality after blood donation, the current study showed that more than half of the donors were poor sleepers, which was improved among those who were living in city, mostly due to better quality of life and among those who donated for more than once which means more frequent blood donation was significantly associated with better sleep quality. Ahmed AE et al [32] reported that 33.8% of Saudi adults reported short sleep duration of less than 7 hours/night. Short sleep duration was more prevalent in females (37.3% versus 31.4%, p=0.004). A higher incidence regarding poor sleep quality among Aseer residents was reported by Alhayyani RM et al [33] where 85.1% of Saudi commission residents had poor sleep quality.

Conclusion and Recommendations

In conclusion, the current study showed that sleep quality among Aseer residents after blood donation was much lower than the reported incidence especially among participants who donated blood more than once. Also, the attitude toward blood donation was good where nearly 1 out of each 2 participants donated blood for moral issues rather than emergency or due to others' need. Public encouragement and motivation towards blood donation is mandatory especially in high altitude residents, to improve their daily life and to promote health related consequences. This can be achieved through health education sessions and through health care providers who can declare the benefits and risks of blood donation.

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