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Relationship between Shift work and High Blood Pressure- A Cross Sectional Study

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ABSTRACT

Although, long-term effects of shift work are difficult to measure, researchers have found compelling connections between shift work and an increased risk of serious health conditions and diseases. To examine whether there is any relationship between the shift work and increase in blood pressure. A cross-sectional survey of Shift-workers (doctors, nurses, technicians and assistants) in the King Fahd university hospital was done by using random sampling technique during the period between October 2013 - December 2013. Blood pressure was measured twice in the sitting position with an automatic sphygmomanometer after 5 minutes of rest. Measurement was taken at the end of the shift. The mean age of the participants was 36.5 ± 4.6 years; 64% were women. The overall prevalence of prehypertension and hypertension was 33% and 4% for shift workers and 40% and 11% for non-shift workers respectively. There was no statistically significant difference in the prevalence of hypertension or pre-hypertension between shift workers and Non-shift workers. Shift workers did not have increase blood pressure and was not associated with hypertension or pre-hypertension.

Keywords: Shift workers, Blood pressure, Hypertension, Prevalence, Saudi Arabia

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INTRODUCTION

Shift work is a form of work scheduling involving a process in which a group of workers succeed each other at the same workstation in shifts. The shifts can be organized either in a rotating, a continuous or a discontinuous fashion. Notwithstanding the patterns of work scheduling, it has been unequivocally accepted that shift work in general disrupts biological rhythms, sleep and social life. In addition, shift work leads to a number of clinical and non-clinical problems. It retards human performance and increases the chances of occurrence of major industrial accidents. Eventually, optimization of human shift work would minimize the occupational health hazards among shift workers, maximize their performance and augment the productivity of their organization [1].

A review of the research found that shift work seems to raise the risk of cardiovascular disease by 40% [2]. In general, the risks seem to grow the longer a person continues to work nights. One analysis found that the risk of stroke increased by 5% for every five years a person performed shift work. However, the stroke risks rose only after a person performed shift work for 15 years [3].

Shift work has also been linked with metabolic syndrome, a combination of health problems like high blood pressure, high blood sugar, obesity, and unhealthy cholesterol levels. It's a serious risk factor for diabetes, heart attacks, and stroke. One 2007 study followed more than 700 healthy medical workers over four years. The incidence of metabolic syndrome was more than three times as high in those who worked night shifts [3].

Recent reports have shown an increased risk of ischemic heart disease among shift workers [4,5]. Shift work is associated with several health problems, possibly due to an impairment of biological rhythms. In particular, an increased risk of coronary heart disease (CHD) has been reported in several studies performed in shift workers [6-16], with a direct association between relative risk (RR) for CHD and time of exposure to shift work [8]. However this significant correlation between shift work and CHD mortality has not been found by other groups dealing with this issue [17].

MATERIALS AND METHODS

A cross-sectional survey of Shift-workers and non shift workers (doctors, nurses, technicians ,assistants and administrative staff) at King Fahd university hospital were selected by using random sampling technique during the period between October 2013 - December 2013 .The Independent variable was shift work and Dependant variable was High blood pressure. Blood pressure was measured twice in two different occasions and mean was taken .Procedure was done in the sitting position with an automatic sphygmomanometer after 5 minutes of rest. Measurement was taken at the end of the shift for shift workers [18].Self-administered standardized questionnaire was used to investigate aspects pertaining to shift working and other risk factors for hypertension. Certified investigators interviewed the participants at the place of work, using a manual with instructions. Every section of the questionnaire was interviewed and blood pressure and anthropometric measurements were taken. Ten percent of the interviews were repeated randomly for quality assurance.

The Inclusion criteria of the study were Adults above the age of 18 year old and adults having working at king Fahd Hospital , University of Dammam. The Exclusion criteria were, adults Known to have hypertension, Taking any medication that effect blood pressure like CNS depressant or stimulant, - Pregnant women, On Systemic steroid chronic use and Known Renal disease . Approval was obtained from Institutional Review Board (IRB) of King Fahd University Hospital of the University of Dammam prior to implementing the study . All the information from the questionnaire was kept confidential. Written informed consent was obtained before the respondents' involvement in the study.

Hypertension is defined as a systolic blood pressure (SBP) of 140 mm Hg or more, or a diastolic blood pressure (DBP) of 90 mm Hg or more, or taking antihypertensive medication. Based on recommendations of the Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC7), the classification of BP for adults aged 18 years or older is as follows. This classification is used as the standard criteria in the present study [19].

RESULTS

Demographic variables showed there were 400 workers participated in the study. Among them 200 shift workers and 200 non shift workers were taken as samples for the study. With respect to gender, 11% of shift workers were males, while 89% of them were females. For non-shift workers, 40% were females, while 60% were males. Other baseline characteristics are shown in table 1. Regarding smoking status, 5.5% of shift workers were smokers, compared with 25% of non-shift workers. There was small difference in the sleeping hours between short and non-shift workers.

The overall prevalence of prehypertension and hypertension was 33% and 4% for shift workers and 40% and 11% for non-shift workers respectively. The prevalence of hypertension by stage of this disease and shift working status is shown in table 2.

Table 3 represents the systolic and diastolic blood pressure among shift and non shift workers. The systolic blood pressure was 118.11 ± 14.34 among shift workers and 117.24 ± 12.71 among non shift workers with $p = 0.518$. The diastolic blood pressure reveals the value of 76.07 ± 10.02 among shift workers and 75.68 ± 10.73 among non shift workers at $p = 0.711$.which reveal no significant association .

Table 4 shows the measurement of systolic blood pressure of shift workers. The results are as follows, Among the shift workers, 127.07 ± 13.4 with the p value of 0.002 were males. There were 117.01 ± 14.1 female shift workers. The lipid profile states that 124.73 ± 13.6 were having high values , 123.13 ± 17.8 were having low level of lipid profile and 117.10 ± 13.9 were having normal lipid profile. The p value was 0.029 which is not significant.

The multivariate analysis results are presented in Table 4. With respect to gender, -10.890 was the un standardized coefficient and -.238 was the standardized coefficient with the t value of -3.217 which is significant at p less than 0.002. Males had significant relationship with shift work and high blood pressure. The coefficient value was -.103 which is standardized and the t value is -1.301 which has the $p = .195$ with regard to age. The data on marital status says that the standardized coefficient as -.068 with the t value of -.886 and the $p = .377$ for the married shift workers. The smokers had the coefficient value of -3.911 which is un standardized and -.066 as standardized with the t value of -.909 and p value of .364. Alcoholics had the un standardized coefficient of 1.383, standardized as .018 with the t value of .257 and p

= .798. Most of the shift worker's parents had the history of hypertension with the un standardized coefficient of 3.482, .123 as standardized coefficient and the t value is 1.719 and p is .087. The lipid profile value shows that there is a relationship between shift and high lipid profile with the t value of -2.048 and p =.042. There is no significant relationship between less sleep timings and high blood pressure with the t value of .646 and the p level of .519.

Table.1: Demographic Variables

Variables		Shift (n=200)	Non-Shift (n=200)	Total (n=400)	P value
Gender	Male	11.0%	60.0%	35.5%	< 0.001
	Female	89.0%	40.0%	64.5%	
Nationality	Saudi	10.0%	68.5%	39.3%	< 0.001
	Non-Saudi	90.0%	31.5%	60.8%	
Age	Less than 40	45.5%	44.0%	44.8%	0.458
	40-49	26.5%	26.5%	26.5%	
	50-59	16.0%	21.0%	18.5%	
	≥ 60	12.0%	8.5%	10.3%	
Marital status	Married	56.5%	71.0%	63.8%	0.026
	Single	41.0%	27.0%	34.0%	
	Divorced	1.0%	1.0%	1.0%	
	Widowed	1.5%	1.0%	1.3%	
Smoker	Yes	5.5%	25.0%	15.3%	< 0.001
	No	94.5%	75.0%	84.8%	
Alcoholic	Yes	2.5%	6.0%	4.3%	0.049
	No	96.5%	90.5%	93.5%	
Lipid Profile	High	12.0%	18.5%	15.3%	0.020
	Low	2.0%	4.5%	3.3%	
	Normal	57.5%	43.0%	50.3%	
Sleeping Hours	>8 hrs.	5.0%	2.0%	3.5%	0.397
	6-8	55.5%	59.5%	57.5%	
	4-6	37.0%	36.5%	36.8%	
	<4	2.5%	2.0%	2.3%	

Table 2 Prevalence of hypertension by shift work status

Category		SHIFT/ NON SHIFT		Total
		Shift worker	Non-shift worker	
	Hypotension	0.5%	0.5%	2
	Desired	62.5%	48.0%	221
	Prehypertension	33.0%	8100.0%	147
	Hypertension Stage 1	4.0%	7.0%	22
	Hypertension stage 2	0.0%	3.0%	6
	Hypertensive emergency	0.0%	1.0%	2
Total		200	200	400

P value = 0.003

Figure.1: Shows the prevalence of hypertension
Histogram(Shift work)

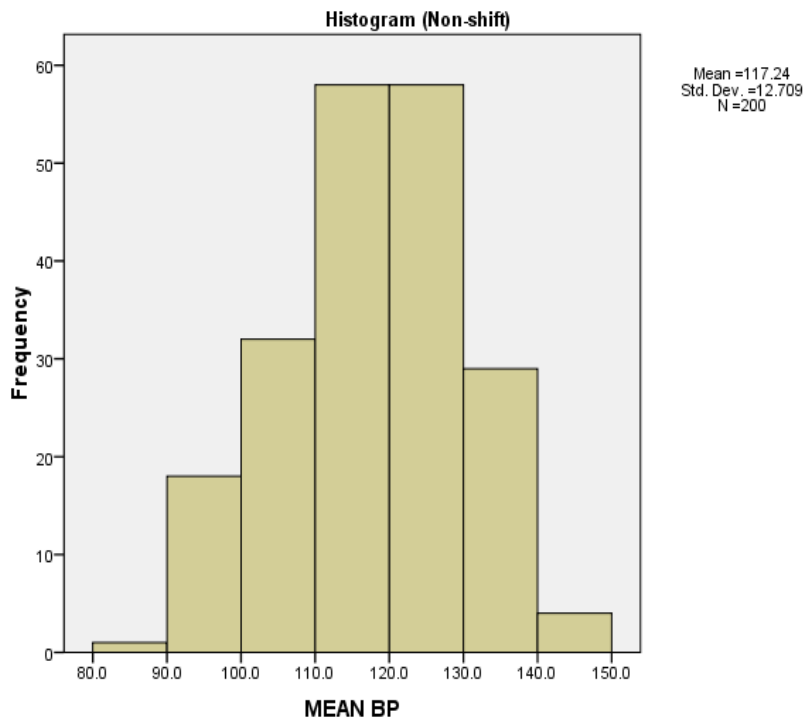
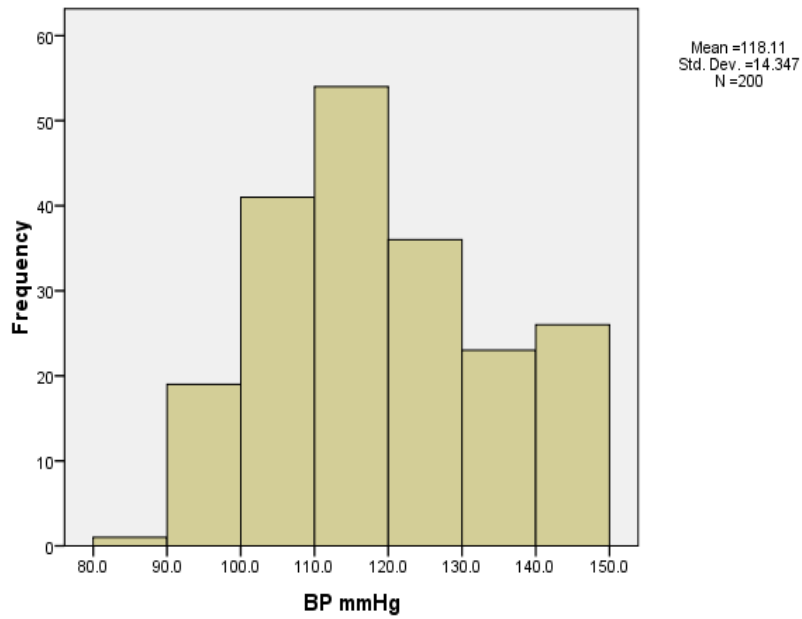


Table.3: Measurement of Systolic and Diastolic Blood pressure in Shift and Non-shift workers

Variables	Shift	Non-Shift	P value
SBP	118.11 ± 14.34	117.24 ± 12.71	0.518
DBP	76.07 ± 10.02	75.68 ± 10.73	0.711

Figure. 2: Shows non-significant relationship between Shift and Non-shift workers related with Systolic Blood Pressure

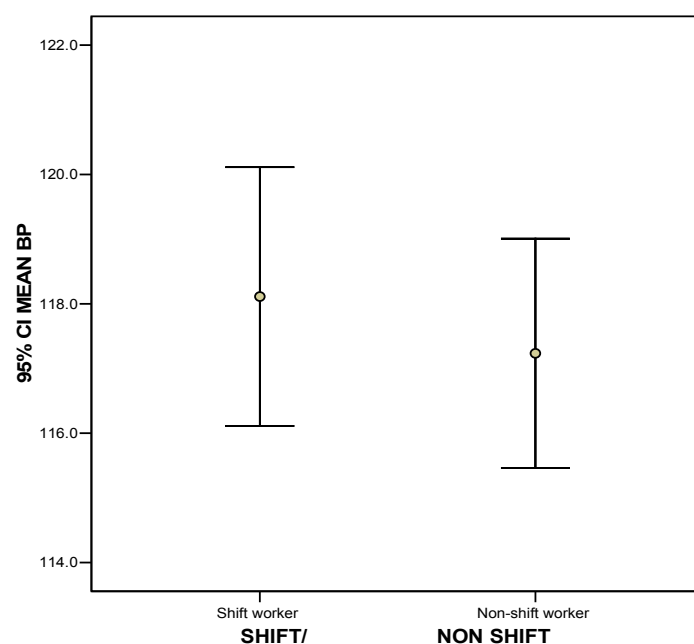


Figure. 3: Shows non-significant relationship between Shift and Non-shift workers related with Diastolic Blood Pressure

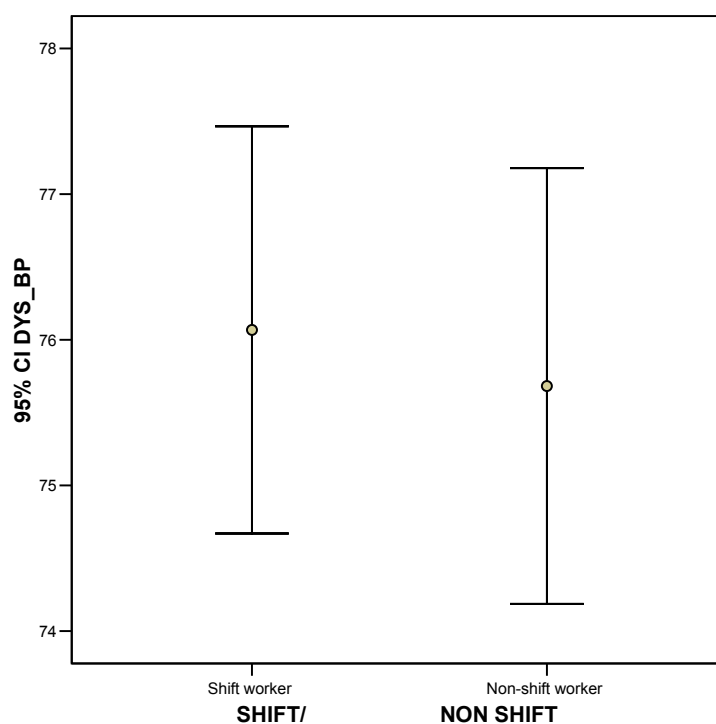


Table- 4: Measurement of Systolic Blood Pressure among shift workers

Variables		Shift workers	P value
Gender	Male	127.07 ± 13.4	0.002
	Female	117.01 ± 14.1	
Lipid Profile	High	124.73 ± 13.6	0.029
	Low	123.13 ± 17.8	
	Normal	117.10 ± 13.9	

Table.5: Risk factors among the shift workers

Model		Un standardized Coefficients		Standardized Coefficients	T	P value
		B	Std. Error	Beta		
1	(Constant)	139.222	16.257		8.564	.000
	GENDER	-10.890	3.385	-.238	-3.217	.002
	NATIONALITY	5.586	3.568	.117	1.566	.119
	AGE	-1.414	1.086	-.103	-1.301	.195
	MARITAL STATUS	-1.634	1.844	-.068	-.886	.377
	SMOKER	-3.911	4.302	-.066	-.909	.364
	ALCOHOLIC	1.383	5.388	.018	.257	.798
	FAMILY Hx OF HTN	3.482	2.025	.123	1.719	.087
	LIPID PROFILE	-2.317	1.131	-.143	-2.048	.042
	Sleeping timings	1.040	1.610	.045	.646	.519

DISCUSSION

This is the first study in the KSA on the relation between work shift at night and blood pressure. It failed to show any significant correlation between shift work and presence of hypertension or prehypertension. This finding is consistent with the results of Sfreddo C and colleagues who reported that there is not any significant association between shift working and the level of blood pressure among a group of nurses [20].

The Finnish Twin Cohort study supports our findings that there is no association between the usual period of work and incidence of hypertension. On the other hand, few studies have proved that shift work is associated with. Possible explanation for the studies that shows positive correlation between night shift and blood pressure is that working mostly at night has been suggested to be associated with deleterious consequences of general health, as a consequence of disturbance of chronobiological rhythms. Disturbances of the circadian sleep rhythm could result in increase the incidence of hypertension and prevent the dipping pattern of blood pressure.²⁰ Studies with short duration have found higher ambulatory blood pressure among shift workers. Shorter periods of sleep, which have been described for shift workers, could also lead to higher blood pressure [21].

Shift work has long been known to disrupt the body clock and be linked to high blood pressure, high cholesterol and diabetes, but the overall impact on cardiovascular health has been unclear. A team of international researchers analyzed the results of 34 studies involving 2,011,935 people to investigate whether shift work was associated with major vascular events. Altogether 17,359 had some kind of coronary event, 6,598 had heart attacks and 1,854 had ischemic strokes caused by lack of blood to the brain. These events were more common among shift workers than other people. Shift work was associated with a 23 per cent increased risk of heart attack, 24 per cent rise in coronary events and five per cent extra strokes. These risks remained consistent even after adjusting for factors such as study quality, socioeconomic status and unhealthy behaviors in shift workers [22].

With respect to multivariate analysis, there are two variables; i.e the gender and lipid profile are significant to blood pressure among the shift workers. This is similar with other studies like Ghiasvand and colleagues showed that high serum total cholesterol and LDL-C level were more common in shift workers than in non-shift workers [23]. Our study includes maximum number of female among the shift workers (89.0%), but male workers has significant increase in Blood pressure. This is doubtful because the sample size is very low and other studies also conflicting results in the literature as to whether men are more affected than women [24, 25].

Our study has two major limitations. The first one was that 89% of the shift workers were females compared with 40% of non-shift workers. Smoking status was statistically higher amongst non-shift workers, which could be related to the high proportion males. The high rate of smokers from the shift group could have increased the prevalence of hypertension amongst this group and alleviated differences between the two groups. However, smoking was not statistically significant predictor of blood pressure in our study.

CONCLUSION

The present study reveals that Shift work did not increase blood pressure and was not associated with hypertension or pre-hypertension. We recommend future larger study to allow comparisons by gender and by other confounding factors such as smoking, weight and physical activity.

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