



Original Article

Comparison on Blood Pressure Among Physicians in Relation to Shift Work and Duration of Employment

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Abstract

Background: Shift work has been found to be associated with various health problems that not only affect workers but also economic and industrial sectors of a country. Disturbance of workers' normal social or biological diurnal rhythms, or both, cause health problems of shift workers.

Objectives: The aim of the study was to compare blood pressure between shift and non-shift physicians.

Methods: This cross-sectional type of comparative study was carried out in the Department of Physiology in Rajshahi Medical College over a period of 12 months from January 2022 to December 2022 among physicians of Rajshahi Medical College and Hospital aged 25-35 years. Approval from the Ethical Review Committee (ERC) was obtained prior to the commencement of the study and the sampling technique was purposive. Pre-designed, validated, structured questionnaire was used to gather information from 230 physicians in Rajshahi Medical College and Hospital.

Results: The mean age of the shift physicians was 30.36 ± 3.13 years and the non-shift physicians was 29.10 ± 3.17 years. Shift physicians were more likely to be overweight (75.70%) than the non-shift physicians (50.40%) with mean BMI of shift physicians was 26.75 ± 1.10 kg/m² and non-shift physicians was 25.34 ± 2.31 kg/m². The mean duration shift work of the physicians was 4.91 ± 2.38 years. Among shift physicians 26.10% were hypertensive, 14.80% were pre-hypertensive and among non-shift physicians 10.40% were hypertensive, 9.60% were pre-hypertensive and there was statistically highly significant relationship between duration of shift work and status of blood pressure of the shift physicians. The mean SBP and DBP in shift physician group were also higher than the non-shift physician group and both of them were statistically significant ($p < 0.01$ and $p < 0.05$ for SBP and DBP, respectively).

Conclusion: Shift work is associated with greater risk of hypertension in shift physicians in comparison to non-shift physicians. As shift work practice is common in industrialized countries as well as in developing countries, interventions to minimize such risk among physicians need to be introduced.

Key words: Shift work, Non-shift work and Blood pressure.

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Introduction

Modern society is changing rapidly both in terms of economic and productive strategies such as new

technologies, market globalization and information processes. Time constraints no longer limit human activities. People want and are able to do everything at any hour of the day or night.

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Therefore, the arrangement of working hours has become a crucial factor in work organization and acquires different values according to economic and social consequences that can arise at different periods of the worker's lives that is called shift work. Shift work is defined as a job schedule in which working hours are outside of the standard daytime hours.¹ In Bangladesh, the number of shift workers is steadily growing though there is no recent survey on it.

Physicians have various types of working schedules and working hours. Shift work has been found to be associated with various health problems that not only affect workers but also economic and industrial sectors. Disturbance of workers' normal biological or social diurnal rhythms or both cause health problems of shift workers. Most human functions have a rhythm, the peaks and troughs of which occur over approximately a 24-hour period, known as circadian rhythms.² These rhythms are determined partly by endogenous factors, the internal body clock and partly by environmental cues such as daylight, noise and the social habits of the individual.³ Multiple physiologic, psychologic and behavioral parameters such as body temperature, serum and urinary corticosteroids and electrolytes, cardiovascular functions, gastric enzyme secretion, blood leukocyte count, muscle strength, alertness, mood and immediate and long-term memory follow circadian rhythms.⁴

Abnormal eating behavior is associated with rotating shift work. Shift workers are reported to eat more to cope with stress and more high-sugar foods in order to stay wakeful.⁵ Lack of proper eating habits and rationally balanced food ratios positively affect the human body, whereas poorly balanced diet coupled with improper nutritional habits may give rise to many diet related diseases such as type 2 diabetes, hypertension, dyslipidaemia, heart diseases and stroke.^{6,7} Hypertension has been attributed to be responsible for 13% of global deaths.⁸ It is a disease with a

high incidence rate among workers and is one of the most significant health problems in medical practice.^{9,10} Obesity, excessive salt intake, drinking habits and lack of habitual exercise have been pointed out as risk factors for hypertension and a relationship between hypertension and work-related factors, especially shift work, has also recently been noted. Therefore, the present study was undertaken to evaluate the changes of blood pressure in apparently healthy physicians of shift workers and non-shift workers to determine the effect of shift work.

Materials and Methods

This was a cross sectional type of comparative study in the Department of Physiology, Rajshahi Medical College, Rajshahi from January 2022 to December 2022 to find out the association between shift work and blood pressure on physicians in Rajshahi Medical College and Hospital. The study population was physicians aged 25-35 years in Rajshahi Medical College and Hospital. A purposive sampling technique was used and the final sample size was 225. Consulting with the guide and reviewing the previous published literature, the questionnaire was developed for the study. Prior to data collection, physicians were briefed about the purpose of the study and their informed written consent was taken. Blood pressure was measured following a standardized protocol, three separate measurements with interval of 1 minutes were recorded after 30 minutes rest in a comfortable chair and finally the average of the last two measurements was recorded. Blood pressure was not repeated among the respondents who were normotensive. But such 3 readings at 1-week interval were taken to confirm the diagnosis of hypertension. Data processing and analysis were done via Statistical Package for the Social Sciences (SPSS) software, version 24.0. The statistical significance was evaluated as appropriate probability level $p < 0.05$ for all tests.

Results

The mean age of the shift physician group was 30.36 ± 3.13 years and the non-shift physician group was 29.10 ± 3.17 years (Table-01).

Table-01: Distribution of the physicians by age (n=115 in each group).

Age in years	Shift physician group	Non-shift physician group
	Frequency (%)	
25-30 years	60 (52.20)	63 (54.80)
31-35 years	55 (47.80)	52 (45.20)
Total	115 (100.00)	115 (100.00)
(mean \pm SD)	30.36 ± 3.13 years	29.10 ± 3.17 years

In the both shift and non-shift physician groups, male physicians were proportionately higher and it were 53.90% and 52.20%, respectively (Figure-I).

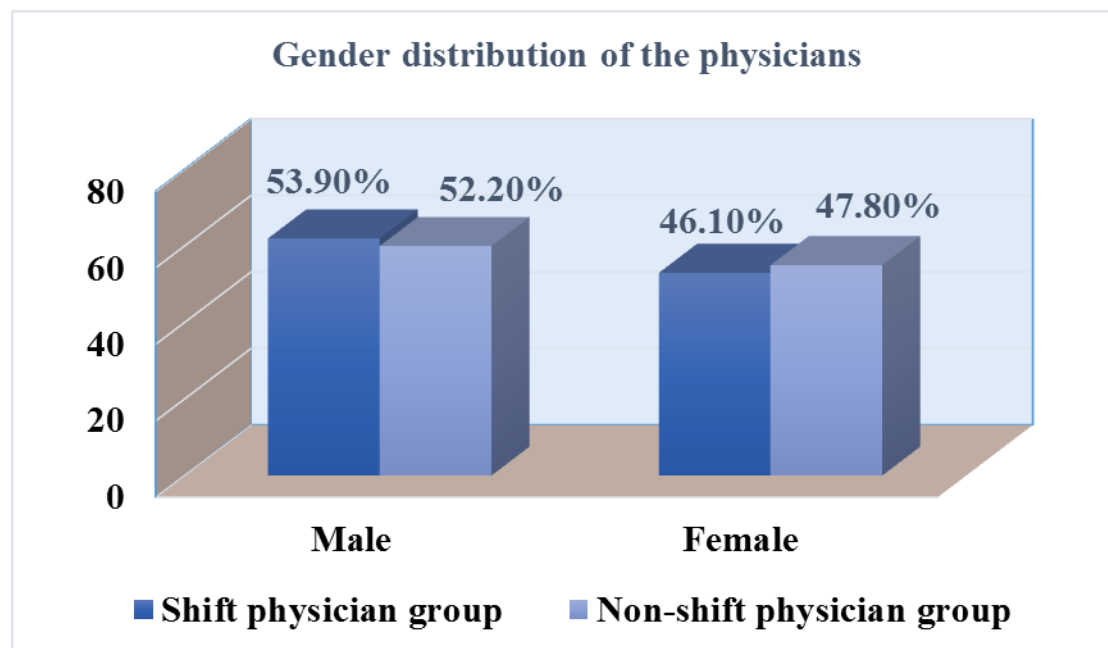


Figure-I: Gender distribution of the physicians (n=115 in each group).

The mean BMI of the shift physician group was 26.75 ± 1.10 kg/m² and the non-shift physician group was 25.34 ± 2.31 kg/m² (Table-02).

Table-02: Distribution of the physicians according to BMI (n=115 in each group).

BMI (kg/m ²)	Shift physician group	Non-shift physician group
	Frequency (%)	
Normal (18.5 to 24.9)	24 (20.90)	56 (48.70)
Overweight (25 to 29.9)	87 (75.70)	58 (50.40)
Obese (30 to 39.9)	4 (3.50)	1 (0.90)
Total	115 (100.00)	115 (100.00)
(mean ± SD)	26.75 ± 1.10 kg/m ²	25.34 ± 2.31 kg/m ²

Duration of the shift work of the physicians revealed that 55.70% of the physicians did shift work for 1-5 years and 44.30% did > 5 years with mean duration 4.91 ± 2.38 years (Table-03).

Table-03: Distribution of the shift physicians on the basis of duration of shift work (n=115).

Duration of shift work	Frequency	Percentage
1- 5 years	64	55.70
> 5 years	51	44.30
(mean ± SD)	4.91 ± 2.38 years	

(N.B.-Only shift physicians were considered here)

Among the shift physicians, 6.96% were under anti-hypertensive medication and among non-shift physicians, 4.35% were under anti-hypertensive medication (Table-04).

Table-04: Distribution of the respondents on the basis of anti-hypertensive use (n=115 in each group).

Type of medication	Group	
	Shift physician	Non-shift physician
Frequency (%)		
Anti-hypertensive drug		
Yes	8 (6.96)	5 (4.35)
No	107 (93.04)	110 (95.65)

Among the shift physicians, 59.10% of the physicians were normotensive, 26.10% were hypertensive and remaining 14.80% were pre-hypertensive. Similarly, among the non-shift physicians, 80.00% of the physicians were normotensive, 10.40% were hypertensive and 9.60% were pre-hypertensive (Table-05).

Table-05: Distribution of the physicians by their blood pressure (n=115 in each group).

Category of blood pressure	Shift physician group	Non-shift physician group
	Frequency (%)	
Normotensive	68 (59.10)	92 (80.00)
Pre-hypertensive	17 (14.80)	11 (9.60)
Hypertensive	30 (26.10)	12 (10.40)
Total	115 (100)	115 (100)

Systolic blood pressure in shift physician group was higher than the non-shift physician group which was statistically highly significant ($p < 0.01$) (Table-06).

Table-06: Comparison of systolic blood pressure between the shift and non-shift physician group (n=115 in each group).

Group	Mean systolic blood pressure (mmHg)	t-value	p-value
Shift physician	121.83 ± 11.15	3.50	< 0.01
Non-shift physician	116.82 ± 10.54		

(Independent Samples t-Test was used to analyze the data and expressed as **mean±SD**)

Diastolic blood pressure in shift physician group was higher than the non-shift physician group which was statistically significant ($p < 0.05$) (Table-07).

Table-07: Comparison of diastolic blood pressure between the shift and non-shift physician group (n=115 in each group).

Group	Mean diastolic blood pressure (mmHg)	t-value	p-value
Shift physician	78.15 ± 8.54	2.39	< 0.05
Non-shift physician	75.83 ± 6.01		

(Independent Samples t-Test was used to analyze the data and expressed as **mean±SD**).

Relationship between duration of shift work and status of blood pressure of the shift physicians was found statistically highly significant ($p < 0.001$) (Table-08).

Table-08: Relationship between blood pressure status and duration of shift work of the shift physicians (n=115).

Status of blood pressure	Duration shift work		Total
	≤ 5 years	> 5 years	
Frequency (%)			
Hypertensive	9 (30.00%)	21(70.00%)	30 (26.1%)
Pre-hypertensive	0 (0.0%)	17 (100.00%)	17 (14.80%)
Normotensive	55 (80.90%)	13 (19.10%)	68 (59.10%)
Total	64 (55.70%)	51 (44.30%)	115 (100%)

$$\chi^2 = 46.87, df=2, p < 0.001$$

Discussion

Shift work disturbs sleep, eating patterns & social life and in the long-term gastrointestinal function. They combinedly responsible for the alteration of blood pressure and lipid profile. The main aim of this study was estimation and comparison of blood pressure between shift and non-shift physicians.

In the current study 55.70% physicians did the shift work for 1-5 years and 44.30% did > 5 years with mean duration 4.91 ± 2.38 years. Nearly similar findings were found in a study done by Chen et al.¹¹ where mean duration of shift work was 6.3 ± 4.8 years. But our findings were far different from a study done by Shafei¹³ where mean duration of shift work was 8.8 ± 4.0 years. This dissimilarity might be due to Shafei conducted the study on factory workers.

In this study, among the shift physicians, majority (59.10%) of the physicians were normotensive, 26.10% were hypertensive and remaining 14.80% were pre-hypertensive. Similarly, among the non-shift physicians, most (80.00%) of the respondents were normotensive, 10.40% were hypertensive and 9.60% were pre-hypertensive. A study done by Nazri et al.¹² in Malaysia reported that the prevalence of hypertension was significantly

higher among shift workers (22.4%) compared to day workers (4.2%) ($p=0.001$) which findings were nearly similar with our study. Nearly similar findings were also found with the studies done by Nagaya et al.¹³ and Alshahrani et al.¹⁴. Nikpour et al.¹⁵ reported that 94.90% shift workers were normotensive, 5.10% were hypertensive and 97.40% day workers were normotensive, 2.60% were hypertensive which findings were different from our findings. Our contradictory findings were also found in a study done by Pietroiusti et al.¹⁶ in Italy where there was no difference between the night-shift workers and daytime workers in terms of hypertension. These dissimilarities might be due to diet factors, physical activity, tobacco and alcohol use and BMI vary from one country to another country.

In the present study, systolic blood pressure in shift physician group was higher than the non-shift physician group and it was statistically highly significantly ($p < 0.01$). Our similar findings were found in a studies done by Chen et al.¹¹, Ghiasvand et al.¹⁷ and De Bacquer et al.¹⁸. But our contradictory findings were found in a study done by Esquirol et al.¹² where systolic blood pressure in shift workers was 138.35 ± 1.48 mmHg and day workers was 138.28 ± 1.46 mmHg and it was

statistically non-significant ($p > 0.05$). Contradictory findings were also found with the studies done by Sfreddo et al.¹⁹, Alshahrani et al.¹⁴ and Sookoian et al.²⁰. The prevalence of hypertension varies across regions and country income groups. The WHO African Region has the highest prevalence of hypertension (27%) while the WHO Region of the Americas has the lowest prevalence of hypertension (18%).

In the current study, diastolic blood pressure in the shift physician group was higher than the non-shift physician group and it was statistically significantly ($p < 0.05$). Our similar findings were found with the studies done by Chen et al.¹¹, Sfreddo et al.¹⁹, Ghiasvand et al.¹⁷, De Bacquer et al.¹⁸ and Sookoian et al.²⁰. Esquirol et al.²¹ reported our dissimilar findings where diastolic blood pressure among shift workers was 89.60 ± 0.99 mmHg and day workers was 88.31 ± 1.01 mmHg. Dissimilar findings also found with the study done by Alshahrani et al.¹⁴. An increased susceptibility of shift workers to develop hypertension can be explained by the fact that shift work triggers the effects of other lifestyle-related factors such as disruption of circadian rhythms, stress and behavior modification.

Conclusion

Hypertension screening programs should be essential for shift physicians and also other shift workers. Over time, poor sleep can also lead to unhealthy habits that can hurt our heart including higher stress levels, less motivation to be physically active and unhealthy food choices. So, everyone should maintain proper sleep, rest and healthy food habit.

Conflict of interest: None declared

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