SLEEP QUALITY AND NEW ONSET POSTPARTUM HYPERTENSION

Baba Z[1]; Mumuni K[2]; Ndanu AT[2]
[1]37 Military Hospital, Accra, Ghana; [2]School of Medicine and Dentistry, University Ghana,

Abstract

***Background*:** Chronic sleep deficiency is a stressful situation which has an association with high blood pressure. After delivery, mothers have disrupted sleep due to frequent awakenings by their infants. What is not known is how significant this relationship is in women during the postpartum period as well as other factors that may affect their Sleep quality. Sleep quality is a measure of duration and disruption.

Aim and Objectives: Study is aimed at determining the relationship between Sleep quality and new onset postpartum hypertension. The specific objectives are; to determine the Sleep quality of mothers in the postpartum period using the Pittsburgh Sleep quality index (PSQI), identify factors that affect Sleep quality of mothers in the post-partum period and determine blood pressure patterns of mothers in the postpartum period.

***Materials and Methods*:** This was a longitudinal study. Using systematic random sampling, a sample size of 126 women were recruited between June and August 2016 in the Postnatal clinic of the 37 Military Hospital. Written consent was obtained from participants. Sitting blood pressure was checked and recorded and a modified form of the Pittsburgh Sleep quality index (PSQI) was used to assign a global score for Sleep quality. A global score of more than 5 indicated poor Sleep quality in that mother. Clients were first recruited at the 1st postnatal visit with follow-up at the 2nd routine postnatal visit (6weeks). Only mothers whose blood pressures were normal during pregnancy and upon discharge from hospital were included. For categorical data, Pearson's chi-square test was used for comparisons and logistic regression as used to determine significant factors that contribute to new onset hypertension in postpartum women. A P-value less than 0.05 was considered significant.

Results: Majority of mothers (92.1% and 90.5% at first and second visits respectively) had poor Sleep quality. Mothers who slept away from their babies at the sixth week visit had better sleep. Mean global Sleep quality scores had no significant association with new onset hypertension but mean scores of some Age , p=0.001, OR =1.20 (C.I: 1.09-1.32) and some sleep components sleep disturbance, p=0.041, OR =1.86(C.I: 1.02-3.37), and use of sleep medicine, p=0.031, OR =1.54 (C.I:1.04-2.29) were significantly associated with new onset postpartum hypertension.

***Conclusion*:** Global poor Sleep quality is not associated with increased odds of new onset hypertension but the Sleep quality components, sleep disturbance and increased use of sleep medicine, were significantly associated with new onset hypertension in mothers.

Key Words: *Sleep quality, sleep, postpartum, hypertension.*

Introduction

In Africa and most developing countries, awareness, control and treatment of the hypertension is suboptimal.[1] Knowledge of the epidemiology of the disease is important to devise intervention strategies. Anecdotal evidence suggests that normotensive women in pregnancy may come in the puerperium with high blood pressure. Some are picked up when they go to hospital for other reasons. These women are usually treated with antihypertensive medications as outpatients or in-patients as necessary. In some cases, the medications have to be increased over time to achieve control. Chronic sleep deficiency is a stressful situation which has an association with high blood pressure[2]. After delivery, mothers have disrupted sleep due to frequent awakenings by their infants. What is not known is how significant this relationship is in women during the postpartum period as well other factors that may affect their Sleep quality.

Corresponding Author: **Baba Zenabu,** 37 Military Hospital Accra, Ghana.
Tel: 00233201681086
Email Address: Zinabu.baba@gmail.com
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Sleep deficiency is a state of inadequate or mistimed sleep unrelated to a primary sleep disorder and it is associated with biological, social, environmental and lifestyle factors[7]. It does not require medical attention but to promote good health, factors that lead to short sleep durations and circadian disruptions must be addressed. Sleep deficiency is associated with major health risks[7]. Short sleep duration (less or equal to 6 hours) with poor Sleep quality is associated with a greater risk of developing coronary heart disease and cardiovascular outcomes such as hypertension, stroke and heart disease[8]. It has also been found to increase the risk of obesity and type 2 diabetes mellitus. Other effects of lack of sleep in the general population include reduction of reaction time during driving increasing the risk of accidents, increased forgetfulness; increased risk of and worsening depression and increased aging of skin[9, 10]. This study aims to determine the relationship between Sleep quality and new onset postpartum hypertension. The sleep quality of postpartum women and factors affecting it as well as blood pressure patterns

of postpartum women and factors affecting blood pressure of postpartum women were determined.

Methods

This was a longitudinal descriptive study of mothers attending the postnatal clinic at the 37 Military Hospital, during the period of the study. The participants were mothers with normal blood pressure during pregnancy and upon discharge from the hospital. All mothers who had high blood pressure (140/90 mmHg or higher) before pregnancy, during pregnancy and or delivery and upon discharge from the hospital or had children with high needs, example: twins, and preterm babies were excluded. Written consent was obtained from all participants. Sitting blood pressure of the clients was checked using the Accoson mercury sphygmomanometer and recorded. To measure Sleep quality, a modified version of the Pittsburgh Sleep quality index (PSQI) was used[11]. The PSQI is a self-reported questionnaire that evaluates Sleep quality within the past month. For the purposes of the study, it was used to measure Sleep quality since delivery at the first postnatal visit; and Sleep quality since the first interview at the 6th week postnatal visit as a follow-up.

The PSQI consists of seven sleep components related to sleep habits including duration of sleep, sleep disturbance, latency, habitual sleep efficiency, and use of sleep medicine, daytime dysfunction and overall Sleep quality. The sleep components yield a score ranging from 0 to 3, with three indicating the greatest dysfunction. The sleep component scores were summed up to yield a total score ranging from 0 to 21. The higher total or global scores indicated poor Sleep quality. Participants with a global score greater than five are classified as poor sleepers and those with a score of five or less, classified as good sleepers[11]. Data pertaining to factors (obstetric, social and financial) that may affect Sleep quality were also collected.

Results

A total of 107 (84.9%) participants out of the 126 interviewed were between the ages of 22 to 43 with mean age of 31.1±4.2 years. Also 113 (89.6%) were married and 103(81.7%) had at least secondary education. Majority of participants had poor sleep at both visits. Single mothers had significantly better sleep (22.2%) than the married and cohabiting mothers, as shown in Table 1.

Table 1: Association between Sleep quality and sociodemographic characteristics

Sleep					**Quality**			
	First Visit				**Second Visit**			
	Good sleep n (%)	Poor sleep n (%)	Total	P value	Good sleep n (%)	Poor sleep n (%)	Total	P value
Age group 18-35 years >35 years Total	 8(7.5) 2(10.5) 10(7.9)	 99(92.5) 17(89.5) 116(92.1)	 107(100) 19(100) 126(100)	 0.650	 10(9.3) 2(10.5) 12(9.5)	 97(9.7) 17(89.5) 114(90.5)	 107(100) 19(100) 126(100)	 0.872
Marital status Married Single Co-habiting Widow Total	 7(6.2) 2(22.2) 0(0.0) 1(100) 10(7.9)	 106(93.8) 7(77.8) 3(100) 0(0.0) 116(92.1)	 113(100) 9(100) 3(100) 1(100) 126(100)	 **0.002**	 9(8.0) 2(22.2) 0(0.0) 1(100) 12(9.5)	 104(92.0) 7(77.7) 3(100) 0(0.0) 114(90.5)	 113(100) 9(100) 3(100) 1(100) 126(100)	 **0.008**
Educational level None Basic Secondary Tertiary Total	 0(0.0) 1(6.4) 4(8.2) 5(8.5) 10(8.0)	 2(100) 15(93.6) 45(91.8) 54(91.5) 116(92.0)	 2(100) 16(100) 49(100) 59(100) 126(100)	 0.967	 0(0.0) 1(6.4) 6(12.2) 5(9.5) 12(9.5)	 2(100) 15(93.6) 43(87.8) 54(91.5) 114(90.5)	 2(100) 16(100) 49(100) 59(100) 126(100)	 0.824

Out of the one hundred and twenty-six (126) mothers recruited for the study, 116 (92.1%) and 114 (90.5%) had poor Sleep quality at the first and sixth week visit respectively. The Sleep quality of mothers did not significantly change during the period as shown in Table 2.

The factors affecting Sleep quality of mothers were grouped into obstetric factors (parity), social support (house work, finance, and housing problems), baby care, and medications taken by mothers. Baby care at night, with respect to sleep arrangements was the only significant factor associated with sleep quality as shown in table 3.

Table. 2 Sleep quality of mothers at first and second visits

	Sleep Quality			
Visit	**Good sleep N (%)**	**Poor sleep N (%)**	**Total N (%)**	**P-value**
First visit	10 (7.9)	116(92.1)	126 (100)	
Second visit	12 (9.5)	114 (90.5)	126 (100)	0.655
Total	22 (8.7)	230(91.3)	252(100)	

Table. 3 Sleep Quality and baby care at night

	First Visit				Second Visit			
Factor	**Good sleep n (%)**	**Poor Sleep n (%)**	**Total n (%)**	**P-value**	**Good sleep n (%)**	**Poor sleep n (%)**	**Total n (%)**	**P-Value**
Sleeping arrangements								
Bedding-in	7(6.3)	104(93.7)	111(100)		8(7.3)	102(92.7)	110(100)	
Rooming-in	2(16.7)	10(83.3)	12(100)	0.116	4(25)	9(75)	12(100)	**0.013**
Separate rooms	1(33.3)	2(66.7)	3(100)		1(33.3)	2(66.7)	3(100)	
Total	10(8.0)	116(92.0)	126(100)		13(10.3)	113(89.7)	126(100)	

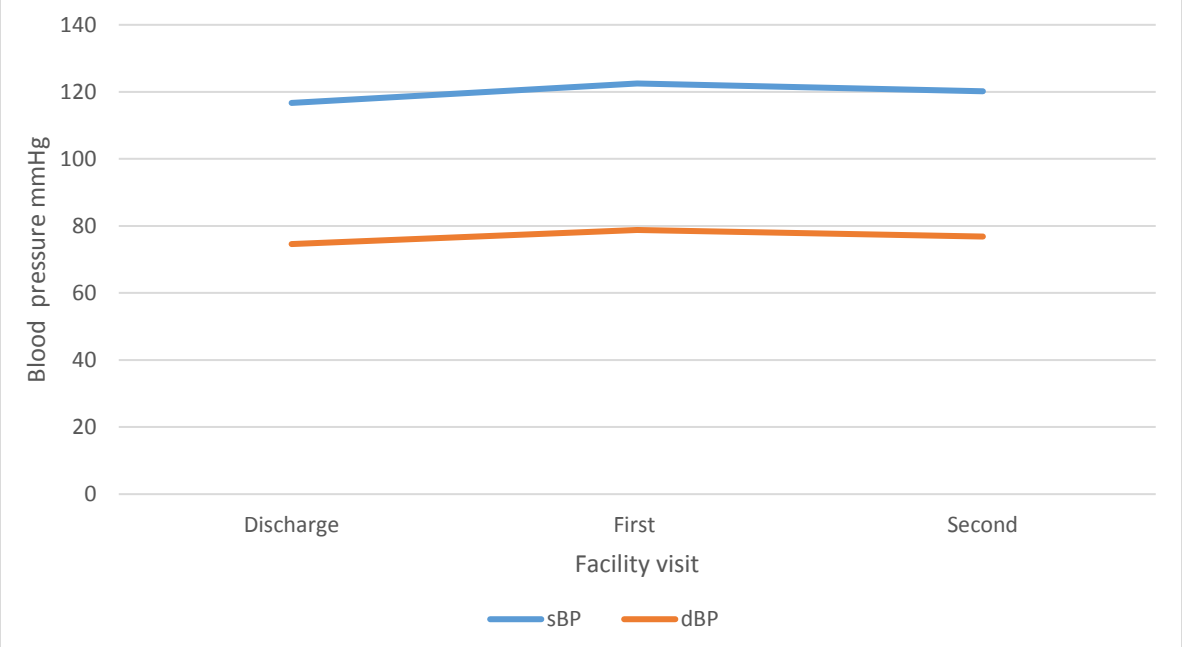

Fig-1 Blood pressure patterns in mothers in the postpartum period

Twenty-nine participants had new onset hypertension during the study period. There was no significant difference between the number of participants who had either systolic hypertension only,

Table 4 New onset hypertension in the postpartum period

Type of Hypertension	1st Visit N (%)	2nd Visit N (%)	P-value
Systolic Hypertension	21 (16.7)	18 (14.3)	0.8900
Diastolic Hypertension	28 (22.2)	21 (16.7)	
Combined Hypertension	15 (11.9)	14 (11.1)	

Of mothers with new onset hypertension, 12 and 19, had both systolic hypertension and diastolic hypertension increased respectively; whereas 16 and 9 were unchanged, respectively. 2 participants had a drop in either systolic hypertension or diastolic hypertension between the first and second visits as shown in table 5.

Table 5 Changes in blood pressures among new onset hypertensive participants from first to second visit.

Change in blood pressure	Participants with Systolic Hypertension	Participants with Diastolic Hypertension
Dropped	1	1
Increased	12	19
Unchanged	16	9
Total	29	29

The association between Sleep quality and new onset hypertension was significant between discharge and the first visit, p= 0.0346 but not between the first and second visit, p= 0.9393. Among clients with poor Sleep quality, majority (79.3%) stayed normotensive with 20.7% developing hypertension as shown in table 6.

There was no statistically significant difference in mean BP between mothers with good sleep and those with poor sleep and this did not change between the visits; p=0.199 and p=0.099 respectively. This is shown in table 7.

diastolic hypertension or combined systolic and diastolic hypertension at the first and second visits as shown in table 4, p=0.8900.

Table 6 Association between Sleep quality and new onset hypertension at first and second visit.

		Sleep quality			
Visit	**Blood pressure**	**Good sleep n (%)**	**Poor Sleep n (%)**	**Total N (%)**	**p-value**
First Visit	Normotensive	5 (50)	92 (79.3)	97 (77.0)	
	Hypertensive	5 (50)	24 (20.7)	29 (23.0)	0.0346
	Total	10 (100)	116 (100)	126 (100)	
Second Visit	Normotensive	10 (83.3)	94 (82.5)	104 (82.5)	
	Hypertensive	2 (16.7)	20 (17.5)	22 (17.5)	0.9393
	Total	12 (100)	114 (100)	126 (100)	

Table 7 Comparisons of mean blood pressures and Sleep quality at first and second visits**.**

Visits	Sleep quality	SBP (mmHg) Mean ± SD	DBP (mmHg) Mean ± SD	p-value
First visit	Good sleep (n=10)	123.6 ±13.4	77.1 ±4.0	
	Poor sleep (n=116)	122.4 ± 13.6	79.2 ± 9.9	0.199
	Total (N=126)	122.5 ± 13.5	79.0 ± 9.7	
Second visit	Good sleep (n=12)	121.3 ± 11.3	78.8 ± 8.3	
	Poor Sleep (n=114)	120.3 ± 14.0	76.9 ± 9.3	0.099
	Total (N=126)	120.3 ± 13.8	77.0 ± 9.2	

Mean age was significantly associated with high blood pressure at the second visit, p=0.001, as shown in table 8 below. The odds of hypertension among participants with a PSQI score of 6 or more total global points was no different from that of participants with 5 or fewer points. Thus, poor Sleep quality was not associated with increased odds of new onset hypertension, p=0.351. This is shown in table 8 below.

Table 8 Factors associated with new onset hypertension in mothers.

Factors	P value	Odds ratio (OR)	95% C.I. for OR
Age	**0.001**	1.22	1.09 -1.35
Parity	**0.001**	0.53	0.33-0.86
Period (1st Visit)	0.203	1.60	0.78- 3.29
Global Sleep quality (good sleep quality)	0.351	1.89	0.50 -7.13

When the effect of the components of Sleep quality on hypertension was used in the multivariate analysis, the results show that sleep duration, sleep disturbance and sleep medicine are all significantly associated with new onset hypertension (after accounting for confounders such as age and parity which were significantly associated with new onset hypertension). These sleep components are therefore independent associated factors. They are also independent of visits. This is shown below, table 9.

Table 9 Effect of components of Sleep quality, age and parity on new onset hypertension in postpartum women**.**

Factors	P-value	Odds Ratio (OR)	95% C.I. for OR
Age	**0.0001**	1.20	1.09-1.32
Parity	**0.007**	0.56	0.37-0.85
Subjective Sleep quality	0.531	0.86	0.54-1.38
Sleep latency	0.592	1.12	0.75-1.67
Sleep Duration	**0.012**	0.53	0.32-0.87
Habitual sleep efficiency	0.148	1.36	0.90-2.07
Sleep disturbance	**0.041**	1.86	1.02-3.37
Sleep medicine	**0.031**	1.54	1.04-2.29
Daytime dysfunction	0.834	1.05	0.66-1.67

Discussion

The sociodemographic characteristics of participants in this study is similar to that found by Klufio *et al* in a study of mothers who delivered at the Korle-bu Teaching hospital (KBTH) in Accra, Ghana. In this study 15.1% as against 10.8% were more than 35 years old, 1.6% as against 5.8% being grand multiparous and 0% as against 18% having no formal education when compared with the KBTH study[12].

Sleep quality of mothers was poor in the postpartum period at both the first and second visits from the study. Mother-infant co-sleeping represents the preferred and obligatory sleeping arrangements for most people in our socio-cultural environment. Under most circumstances, this arrangement continues to provide maximum protection and nutrition for the highly neurologically immature and slow developing infant and is believed to be the most favourable arrangement for optimal breast-milk production[13, 14]. However, sleeping separately from the baby at the second visit was the only factor found in the study to affect, positively, mothers sleep quality; p=0.013. This may be due to physiological factors that affect postpartum maternal sleep. High levels of oestrogen and progesterone occur in late pregnancy and have a sleep promoting effect (reduced sleep latency and increased sleep duration) and these decreases after delivery when the hormonal levels fall[15].This coupled with the infant's relatively immature circadian rhythm, leads to worsening sleep disturbance for the mother if she sleeps close to her baby.

Blood pressure patterns of Mothers in the postpartum period showed an initial rise since there is mobilization of extracellular fluid into the intravascular compartment and the administration of intravenous fluids during labor and delivery additionally causes increased intravascular volume.[16] High doses of nonsteroidal anti-inflammatory drugs (NSAIDs) for pain control also increases fluid retention and mean blood pressure by 5 to 6 mm Hg (through salt and fluid retention and vasoconstriction mediated via inhibition of prostaglandin synthesis).[17] Similar results was found in this study; a mean rise of 4.3 mmHg and 2.4 mmHg at the first and second visits respectively, Figure 1. Some 29 mothers (out of the 126 studied) developed hypertension with no significant difference between systolic only diastolic only or combined hypertension. Except in one client whose blood pressure dropped to normal at the second visit, all other newly diagnosed hypertensive mothers stayed same or had an increase within the study period. (Tables 4 and 5). The prevalence of new onset hypertension in Mothers at the first postnatal visit in this study was 23.0% and 17.5% at the second postnatal visit; the prevalence in participants with poor Sleep quality being 20.7% and 50 % in those with good Sleep quality (Table 6). This is lower than the prevalence of hypertension of 51.0% found in a Chinese rural population by Ru Qing et al in which participants with poor sleep had 66.7% and participants with good sleep had 44.4% prevalence of hypertension.[2] The lower prevalence in this study,

23%, may be due to the overall high prevalence of poor Sleep quality among participants, and the fact that we were dealing with hypertension of new onset (as against already hypertensive clients). On the whole however, mean blood pressure of Mothers stayed within normal range. Table 7.

Although Global sleep quality was not found to be associated with new onset hypertension, some sleep quality components, thus, sleep duration, sleep disturbance and use of sleep medicine were found to be significantly associated with new onset hypertension. In normotensive adults, short sleep duration has been found to be associated with an increased risk of hypertension incidence.[18] In this study however, the odds of sleep duration were less for hypertensive participants compared to normotensive clients, p=0.012, OR=0.53 (C.I: 0.32-0.87), (Table 9). This may be explained by the fact that Mothers tend to overestimate their nocturnal wake times. The lower risk of shorter sleep duration observed in this study is therefore likely to be due to the exaggerated responses of participants.[19] The inverse association of sleep duration on new onset hypertension in this study cannot be fully explained. Sleep disturbance (due to increased frequency of using the washroom at night and inability to sleep due to feeling hot or cold) was also found to be associated with an increased incidence of new onset hypertension as in other studies.[18] There is paucity of data regarding the use of sleep medicine and new onset hypertension, however the risk for hypertension in poor sleepers with poor sleep component scores (scores more than 0) in all of the elements is established.[2] And thus in this case if a new mother's Sleep quality was bad enough for her to use sleep medicine, then, she is at increased risk of developing new onset hypertension; p=0.031 (O.R= 1.54, (C.I: 1.04-2.29).

In this study, increasing age increases risk of new onset hypertension p=0.0001. O. R=1.20 (C.I.; 1.09-1.32) whereas increasing parity is protective p=0.007, O.R=0.56 (C.I.; 0.37-0.85). These results are similar to that of a study in Saudi Arabia done to determine the effect of age, obesity and parity on hypertension in non-pregnant women.[18] In that study, age increased the risk of hypertension; p<0.0001 for hypertension (OR=1.53, (C.I:1.1-1.2). Parity was however not significantly associated with hypertension, even though the effect on hypertension was negative too, p<0.1, (O.R=0.87 (C.I: 0.74-1.03).[18]The difference between the studies suggests that the negative (protective) effect of increasing parity on hypertension becomes less significant outside the postpartum period. Both results also show that nulliparity rather than multiparty is associated with risk of hypertension.[18]

Limitations of the study

Personal and family history of sleep disorders were excluded and Sleep evaluation based on a combination of polysomnography (the gold standard laboratory test of sleep quality) or wrist artigraphy and self-reported questionnaires may have provided a different result especially with regards to sleep duration.[20]

Conclusion

Global Sleep quality of mothers in the postpartum period is generally poor, however new onset hypertension in these mothers was associated with increasing maternal age, and maternal sleep disturbance and maternal use of sleep medicine. Also, increasing parity was significantly associated with lower risk of new onset hypertension in the postpartum period. Mothers who present with new onset hypertension may benefit from sleeping in very comfortable rooms away from their babies with less frequent use of washrooms during sleep.

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