

# The impact of rotating shift work on eating patterns and self-reported health of nurses in Malawi

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## ABSTRACT

The aim of this study was to assess the effect of rotating shift work on eating patterns and self-reported health of nurses. Twenty four female nurses on irregular rotating shift work were randomly selected from among medical personnel at Queen Elizabeth Central Hospital (QECH), Blantyre, Malawi. Controls were 22 nurses who did not perform night duties. Appetite, eating pattern satisfaction, regularity of meals, health perception; number of full meals and snacks were assessed using standardized and locally validated questionnaire. It was found that rotating shift work had significant effect on the amount of full meals (d.f. = 2,  $F = 24.3$ ,  $P = 0.000$ ), appetite (d.f. = 2,  $F = 15.2$ ,  $P = 0.000$ ) and eating pattern satisfaction (d.f. = 2,  $F = 22.5$ ,  $P = 0.000$ ). Comparison of the two groups of nurses indicated that volunteers in the study group had lower number of reported full meals per

day ( $t = 6.37$ ,  $P < 0.001$ ), lower self-assessed appetite ( $t = 3.22$ ,  $P < 0.01$ ) and eating pattern satisfaction ( $t = 6.52$ ,  $P < 0.01$ ) during the night-shift phase of the rotating shift cycle than nurses on the day-shift schedule. All responders in the study group and 40.9% of nurses in the control group reported irregular eating pattern. Significant association was found between the self-reported health scores and appetite (d.f. = 3,  $F = 8.89$ ,  $P = 0.000$ ), amount of full meals (d.f. = 3,  $F = 11.77$ ,  $P = 0.000$ ) and eating habit satisfaction (d.f. = 3,  $F = 18.3$ ,  $P = 0.000$ ) in both groups of nurses. Nurses who reported irregular eating pattern had significantly lower subjective health score ( $t = 3.33$ ,  $P < 0.01$ ) than nurses who consumed food regularly ( $2.9 \pm 1.2$  and  $1.8 \pm 0.9$ , respectively).

## Introduction

The eating habits of shift workers have attracted considerable attention of nutritionists, chronobiologists and physicians. Numerous studies have demonstrated that shift work affects circadian distribution of food, regularity of meals and the number of meals eaten during different phases of shift cycle.<sup>1,5</sup> In addition, shift-workers have reduced eating habit satisfaction and appetite compare to permanent day-workers.<sup>2,3</sup> It has been suggested that changes in eating behaviour of shift-workers are brought about by desynchronization of the circadian systems and logistical demands of rotating and night shifts.<sup>6,7</sup>

Workers perception of their own health relative to other people of similar age has a subjective character but it is an important predictor of physical and psychological well being of a person.<sup>8</sup> Several studies have showed that shift-workers tend to report low scores of subjective health due to physical, psychological and social consequences of working irregular hours.<sup>1,2,9</sup> However irregularity of the meals is the most important nutritional determinants of self-reported health of shift-workers.<sup>1</sup> Prevalence of gastrointestinal symptoms among shift workers is also higher compared to permanent day-workers and it is likely that impaired nutritional hygiene is in part responsible for gastrointestinal disorders.<sup>6,7,9</sup>

Very limited studies were reported on effects of rotating shift work on nutritional behaviour and health of workers in developing countries and none of them were conducted on medical personnel, particularly nurses. Cultural, economical and social conditions in Malawi differ from those in developed countries and rotating shift work might have different or more adverse effects on eating habits and self-perceived health of medical personnel. The aim of the present survey was to assess the effect of rotating shift work on eating pattern and self-reported health of nurses on rotating shift work.

## Materials and methods

The study was conducted at Queen Elizabeth Central Hospital

(QECH), Blantyre, Malawi. Twenty nine nurses were selected from the staff list in paediatric, surgical and medical wards using systematic random sampling. Twenty four female nurses completed all questionnaires and were included in study population. Nurses worked on three-shift schedule: five day shifts (07.00 – 17.00 hrs), followed by three night shifts (17.00 – 07.00 hrs) and five days off. Due to inadequate staffing situation, this shift pattern was often altered and might be considered as irregular. Nurses were followed for the entire shift cycle which lasted 13 days. Controls were recruited from among female nurses who were not performing night-time duties. The control group was matched with the study group by age and length of service. Twenty six nurses were approached, 22 returned completed questionnaires. The sampling procedure and characteristics of both groups of nurses have been described earlier as the same responders participated in another survey.<sup>10</sup>

Nurses were asked to fill in a standardized questionnaire during the survey. The validity and reliability of the items has been demonstrated in several studies.<sup>11</sup> In order to test content validity of the instrument, we asked 10 nurses to review the questionnaire and to comment on the apparent validity of each item, to clarify confusing items and to update terms. No items were changed, which indicated the high validity of the instrument in local setting.<sup>12</sup>

Items of the questionnaire included: (1) number of full meals and snacks eaten during the night and day shifts and days off; (2) self-assessment of eating pattern satisfaction on a 6-point scale where higher score indicated lower level of satisfaction; (3) indications of whether meals were eaten at the same time on each shift; (4) rating of appetite on a 4-point scale from good (1 point) to bad (4 points); (5) self-assessment of health compared to other people of similar age using a 5-point scale from excellent (1 point) to poor (5 points).

Statistical analysis was carried out using one-way analysis of variance and students t test with a Bonferroni correction.<sup>13</sup> The level of statistical significance was set at  $P < 0.05$ .

## Results

**Table 1. Means and standard deviations of nutritional behaviour of the group of nurses on rotating shift work.**

	Number of full meals	Number of snacks	Appetite	Eating pattern satisfaction
Day shift	2.06±0.68	1.56±1.15	2.35±1.09	3.10±0.69
Night shift	1.13±0.50	1.40±1.26	2.99±0.81	3.51±0.70
Days off	2.44±0.81	1.81±1.11	2.13±0.98	2.36±0.86

Table 1 shows the average number of full meals and snacks, subjective score of appetite and eating habit satisfaction of the study group of nurses as a function of the shift phase. No significant difference was observed between various days of the same shift phase. One way analysis of variance demonstrated significant effect of the shift phase on the amount of full meals (d.f. = 2,  $F = 24.3$ ,  $P = 0.000$ ). This was mainly due to the difference between the night and day shifts ( $t = 4.86$ ,  $P = 0.0002$ ) and the night shifts and days off ( $t = 6.01$ ,  $P = 0.000$ ). Shifts did not significantly affect the amount of snacks. Effect of shift work on self-assessed appetite was significant (d.f. = 2,  $F = 15.2$ ,  $P = 0.000$ ) with lowest level of appetite during the night work ( $t = 6.0$ ,  $P = 0.000$ ). Shift work also significantly (d.f. = 2,  $F = 22.5$ ,  $P = 0.000$ ) affected eating pattern satisfaction of nurses on the rotating shift work especially during the night-shift phase ( $t = 5.93$ ,  $P = 0.000$ ).

**Table 2. Means and standard deviations of nutritional behaviour of the control group of nurses.**

	Number of full meals	Number of snacks	Appetite	Eating pattern satisfaction
Working days	2.26±0.59	1.45±1.11	2.08±0.89	2.18±0.61
Days off	2.36±0.76	1.62±1.08	1.96±0.81	2.10±0.78

Table 2 shows indicators of eating behaviour of the control group of nurses. The differences in the number of full meals and snacks, appetite score and self-reported eating pattern satisfaction between working days and days off in this group of workers was not statistically significant. Comparison of the two groups of nurses indicated that volunteers in the study group had lower number of reported full meals per day ( $t = 6.37$ ,  $P < 0.001$ ), lower self-assessed appetite ( $t = 3.22$ ,  $P < 0.01$ ) and eating pattern satisfaction ( $t = 6.52$ ,  $P < 0.01$ ) during the night-shift phase of the rotating shift cycle than nurses on the day-shift system. At the same time, during the day-shift phase and days off phase of the rotating shift cycle these parameters were similar to the control group of nurses. The difference between 2 groups in the number of snacks was not statistically significant.

All nurses on the rotating shift cycle indicated that they consume meals at different times even during days off. This was quite different from nurses who were not involved in shift work because only 9 nurses (40.9 %) in the control group reported irregular eating pattern.

The mean score of self-reported health of the group of nurses on rotating shifts was  $2.6 \pm 1.3$  and in the control group was  $2.1 \pm 1.2$  ( $t = 1.35$ ,  $P > 0.05$ ). No one indicated the lowest health category. Significant association was found between health scores and appetite (d.f. = 3,  $F = 8.89$ ,  $P = 0.000$ ), amount of full meals (d.f. = 3,  $F = 11.77$ ,  $P = 0.000$ ) and eating pattern satisfaction (d.f. = 3,  $F = 18.3$ ,  $P = 0.000$ ) in both groups of nurses. Nurses who reported irregular eating pattern had significantly lower subjective health score ( $t = 3.33$ ,  $P < 0.01$ ) than nurses who consumed food regularly ( $2.9 \pm 1.2$  and  $1.8 \pm 0.9$ , respectively).

## Discussion

This study indicated that irregular shift work interferes with eating pattern of nurses. The number of meals eaten per day was affected by shift work with only one full meal was taken by most of nurses during the night-shift phase of the shift cycle. For comparison, the same nurses had two or more meals during the day shifts and days off, which was similar to the control group of responders. This finding is generally in agreement with early reports,<sup>2,3,14</sup> which showed that night workers eat fewer meals. In addition, the number of full meals in both groups of Malawian nurses was considerably lower than in other studies.<sup>2,3,14</sup>

Another important finding in this study was high irregularity of meal consumption in the study group compare to the control group, which concurs with other surveys.<sup>2,3,15</sup> However overall distribution of food consumption of Malawian nurses who performed irregular shift work was more affected compare to shift-workers in western countries. For example, only half of the USA miners on rotating shift work indicated that they ate at different time each day<sup>1</sup>, while all Malawian nurses in the study group reported irregular eating pattern. The present study also confirmed the high prevalence of dissatisfaction with eating habits and poor appetite among shift-workers.

Analysis of eating pattern of Malawian nurses on rotating shift system raises three important questions. Firstly, what are the possible reasons for impaired eating pattern of nurses? Secondly, how shift-workers compensate for decreased amount of full meals? Thirdly, what are the consequences of impaired eating pattern on nurses' health and possible coping strategies? Several social, economic and cultural factors can contribute to considerable reduction in the amount of full meals and irregular timing of meals. Eating pattern of nurses involved in shift work requires integration with their diurnally oriented families. Most of night-workers sleep through at least one usual meal time and they tend to skip breakfast and lunch.<sup>2</sup> One other important factor is logistical demands of work. Most of wards at the hospital are understaffed and nurses do not have time or they are too tired to take a full meal. The hospital also does not have facilities to provide full meal for workers during the night shifts. Our study indicates that impaired appetite, particularly during the night shifts, might be also responsible for decreased amount of full meals.

Several studies have demonstrated that shift work does not affect caloric intake and energy requirements of workers.<sup>16,17</sup> The present study was focused on assessment of nutritional behaviour of shift-workers and it was not designed to assess daily caloric intake of nurses. In western countries, shift-workers compensate for the reduction of full meals by increasing the number of 'snacking' and 'nibbling'. This is quite different from the present study where the reported number of snacks was not affected by the shift work. We can only speculate that nurses in the study group consumed more food per full meal than day-workers. It is also worth to mention that the nurses in this study had extensive experience in rotating shift work that might result in partial adaptation to this working schedule. Takagi (1972) argued that a reduction in the number of meals eaten per day may not have negative consequences.<sup>18</sup> Two meals per day was the rule for most workers up to the time when electric light become popular. Therefore, according to Takagi, two meals per day is normal and natural, with more than three meals per day being a fairly modern practice that may or may not be related to nutritional needs. Contrary to some published studies,<sup>1,2</sup> the subjective health measure of Malawian nurses was not affected by shift schedule. However the self-rated health score in both groups of nurses was related to regularity in food consumption, appetite, eating pat-

tern satisfaction and the amount of full meals which indicated the importance of these nutritional parameters for perception of own health.

Since self-reported health seems to be related to varying components of eating behaviour, which is to some degree self-directed, it is plausible to suggest several coping mechanisms for shift-workers. Regularity of food intake seems to have beneficial implications on health perception. It is also important to have the same number of full meals during the day- and night-shift phases of the rotating shift cycle. It is being suggested that the worst possible scenario is changing the number and regularity of meals eaten per day especially during the night shifts. Nurses working at night should be provided with similar food services to those working during the day-time shifts. Although it may be difficult to determine which food should be available for the night-shift nurses, it is relatively easy to have adequate and appropriate supply of nutrients at all times.

The data reported in the paper are subjective and have validity and reliability limitations associated with this type of study. The subjective aspect of nutritional behaviour as well as health perceptions are difficult to measure but this subjective parameters are very important for well being of shift-workers.

In conclusion, rotating shift work alters eating pattern of nurses particularly during the night shifts. Night work also reduces eating pattern satisfaction and appetite of nurses, which is associated with low subjective health score. Nurses at the hospital should be counselled on nutritional hygiene and food service during night work should be improved.

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