

# Dietary habits among persons hired on shift work

Joanna Strzemecka<sup>1</sup>, Iwona Bojar<sup>2</sup>, Ewa Strzemecka<sup>3</sup>, Alfred Owoc<sup>4</sup>

<sup>1</sup> Pope John Paul II State School of Higher Education in Białą Podlaska, Institute of Public Health, Poland

<sup>2</sup> Department for Health Problems of Ageing, Institute of Rural Health in Lublin, Poland

<sup>3</sup> Poznan University of Medical Sciences, Poland

<sup>4</sup> College of Public Health, Zielona Góra, Poland

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## Abstract

**Introduction.** Shift-work determinates irregular nutrition habits. The quality as well as the quantity of meals consumed by shift-workers can significantly affects their health.

**Objective.** The aim of this study was to evaluate the dietary habits of people performing shift work in the Bogdanka mine.

**Material and Methods.** The study was carried out in the Bogdanka mine in Leczna. The questionnaire, which was designed by the author of this dissertation, was conducted among 700 shift-workers, working underground. The results were subjected to statistical analysis based on STATISTICA v. 7.1 (StatSoft, Poland) software.

**Results.** Nearly half of respondents reported regular consumption of meals (40.0%) Interviewees admitted having warm meals during the day (81.4%). The most frequently consumed meal during the day was the hot one (50.9%), three meals and more were consumed the least frequently (8.1%). Almost half of respondents considered their eating habits as inappropriate (46.3%). Among those, nearly half (68.2%) stated that shift – work is the reason for their nutrition habits. More than half of respondents (66.0%) admitted that shift work hampers regular consumption of meals.

**Conclusions.** Shift work makes nourishment and regular consumption difficult. It contributes to the limited amount of warm meals eaten during the day. In order to maintain preventive health care and the improvement of quality of life, shift workers should be provided with an easier access to meals (including warm one) at specified times of the day.

## Key words

Eating habits, shift-work, meals

## INTRODUCTION

Shift workers, especially those working on night shifts, must function in a discipline that is unnatural. Sleep, wakefulness, digestion, adrenaline secretion, body temperature, blood pressure, pulse and many other body functions are regulated by circadian rhythm [1].

The global increase in the prevalence of obesity and metabolic disorders coincides with the increase of exposure to light at night (LAN) and shift work. Circadian regulation of energy homeostasis is controlled by an endogenous biological clock that is synchronized by light information [2]. Importantly, light is the most potent entraining signal for the circadian clock, although other factors such as food consumption influence clock signaling [3].

Shift work disrupts clock function and is linked to circadian and metabolic consequences including sleep disturbances [4]. Sleep deficiency leads to hormone disturbances. Chronic deficiency of sleep is associated with increased level of cortisol in the evening and with intensive activity of the sympathetic nervous system [5, 6, 7].

Control of glucose level is disturbed as well as level of hormones responsible for appetite (leptin) which increases dramatically (epidemiological studies show negative relation between time of sleep and BMI). It also has to be noticed

that sleep deficiency decreases efficiency of immunological system [8].

Compared to individuals who work during the day, shift workers are at higher risk of a range of metabolic disorders and diseases (eg, obesity, cardiovascular disease, peptic ulcers, gastrointestinal problems, failure to control blood sugar levels, and metabolic syndrome). At least some of these complaints may be linked to the quality of the diet and irregular timing of eating, however other factors that affect metabolism are likely to play a part, including psychosocial stress, disrupted circadian rhythms, sleep debt, physical inactivity, and insufficient time for rest and revitalization [9]. Studies of the effects of shift work on eating habits and nutrient intake have previously been conducted. Most studies did not find a difference between shift workers and daytime workers with respect to their total calorie intake and their dominant macronutrient intake.

Instead, many reports found there were changes in eating habits and food selection among shift workers.

It has also been reported that workers who work irregular hours develop a loss of appetite and become reluctant to prepare meals due to difficulties in adjusting to social life and internal circadian rhythm [10].

The aim of this study was to evaluate the dietary habits of people performing shift work in the Bogdanka mine.

Adress for correspondence: Joanna Strzemecka, Pope John Paul II State School of Higher Education in Białą Podlaska, Institute of Public Health, Sidorska 95/97, 21-500 Białą Podlaska, Poland  
e-mail: joannastrzemecka@wp.pl

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## METHODS (METHODOLOGY)

Studies were conducted in the Bogdanka mine in Leczna. Respondents working underground in a shift system were randomly chosen, independently of their position.

700 hundred workers who attended compulsory courses at the workplace in the period of January- April 2006 were examined. The questionnaire was designed by the author of this dissertation. In order to verify this scientific tool, a pilot investigation was carried out (50 people). This approach created the final version of questionnaire.

The forms included the following issues: age, length of shift work service, and influence of shift-work on eating habits of respondents. The results were subjected to statistical analysis. In order to identify distinctions and dependences between variables,  $\chi^2$  test was used. For small numbers, Yates correction was applied. 5% inference error was considered. Values with probability < 0.05 were taken as statistically significant. Statistical analysis was based on STATISTICA v. 7.1 software (StatSoft, Poland)

## RESULTS

In order to evaluate the lifestyle of respondents, regularity of their meals was analyzed.

Nearly half of the interviewees admitted regular consumption of meals (40.0%).

Significantly, the affirmative answers were given mostly by young people at the age of 21–30 (50.0%). Also men at the age of 31–40 declared regular meals (27.0%). People aged 41–50 were the least regular of consumers (40.8%) (Tab. 1).

Respondents confirmed presence of hot meals in daily consumption (81.4%) (Tab. 1).

Most frequently, the responders ate one warm meal during the day (50.9%), a few ate three meals and more (8.1%) (Tab. 1).

Significant relation between age, job tenure and behaviours as well as number of warm meals during the day, was observed ( $p < 0.05$ ) (Tab. 1, 2).

Men at the age of 51 and over (12.1%) (Tab.1) with the shift work tenure accounting for 1 up to 10 years (5.3%) (Tab.2) were noticed as the most numerous group which do not eat warm meals during the day. Respondents at the age of 21–30 (63.4%) (Tab.1) whose job tenure accounted for 1–10 years (56.8%) (Tab.2) mostly declared eating one warm meal during the day.

The highest percentage of those who declared they regularly eat warm meals referred to men at the age of 41–50 (86.5%) (Tab.1) that had done shift work for over 21 years (87.7%) (Tab. 2).

The youngest respondents (63.4%) (Tab.1) and those with the shortest work experience (56.8%) (Tab. 2), were among the group which ate warm meals most often. Such tendency decreased along with the age and length of job tenure. Consumption of two or three meals during the day increased along with age and years of work experience.

Nearly half of respondents considered their eating habits as inappropriate (46.3%). Among those, more than half (68.2%) pointed to shift work as the reason for their irregular nutrition habits (Tab.1, 2, 3). Such an opinion was declared by the oldest men, at the age of 51 and over, (78.6%) and their number decreased along with younger (Tab. 1)

**Table 1.** Regular food consumption, presence of hot meals in daily consumption, proper nourishment, shift-work as the cause of irregular consumptions, amount of warm meals consumed each day by respondents, shift-work as the cause of incorrect nourishment marked by aged of respondents

		Age [years]				Statistic
		21–30	31–40	41–50	51 and more	
Regular food consumption	Yes	50.0%	32.9%	40.8%	42.4%	40.0%
	No	32.1%	40.1%	40.8%	39.4%	39.14%
	Sometimes	17.9%	27.0%	18.4%	18.2%	20.86%
Presence of hot meals in daily consumption	Yes	73.2%	79.2%	86.49%	69.70%	81.4%
	No	2.7%	2.9%	2.0%	12.1%	2.9%
	Sometimes	24.1%	17.9%	11.5%	18.2%	15.7%
Proper nourishment (self evaluation by respondents)	Yes	56.2%	50.2%	54.3%	60.6%	53.7%
	No	43.8%	49.8%	45.7%	39.4%	46.3%
Shift-work as the cause of irregular consumptions	Yes	58.0%	66.7%	68.7%	60.6%	66.0%
	No	42.0%	33.3%	31.3%	39.4%	34.0%
Amount of warm meals consumed each day by respondents	1	63.4%	50.9%	49.2%	29.2%	50.9%
	2	34.2%	43.6%	40.8%	50.0%	41.0%
	3 and more	2.4%	5.5%	10.0%	20.8%	8.1%
Shift-work as the cause of incorrect nourishment	Yes	46.9%	69.6%	73.0%	78.6%	68.2%
	No	53.1%	30.4%	27.0%	21.4%	31.8%

More than half of respondents (66.0%) reported that shift work makes it difficult to follow regular consumption of meals (Tab.1, 2, 3).

Among those who declare shift work as the reason for health deterioration, every third respondent regularly ate meals (32.0%) and every fifth (20.5%) followed regular meals from time to time  $p < 0.05$  (Tab. 3).

Often, people who pointed out that shift work negatively influences their health state ate one warm meal during the day (55.0%) (Tab. 3).

Respondents confirming that shift work might lead to deterioration of health, in almost 50% of cases (55.0%) did not eat properly. Most of them (76.3%) declared that shift work was the reason for their inappropriate nutrition habits (81.3%) (Tab.3).

Significantly important is the fact that people, who pointed that shift work negatively influences their health state, ate one warm meal during the day (55.0%) (Tab.3).

Men who admitted that shift work might negatively influence their health, in nearly fifty cases (56.4%) did not eat properly and most of them (76.3%) reported shift work as the reason for irregular consumption of meals (81.4%) (Tab.3).

**Table 2.** Regular food consumption, presence of hot meals in daily consumption, proper nourishment, shift-work as the cause of irregular food consumptions, number of warm meals consumed by respondents with reference the number of years worked in the shift type

		Number of years worked in the shift type				Statistic
		1–10	11–20	21 and more	Summary	
Regular food consumption	Yes	44.4%	38.3%	37.9%	40.0%	$\chi^2=4.02$ $p=0.40394$
	No	36.3%	38.6%	43.1%	39.1%	
	Sometimes	19.3%	23.1%	19.0%	20.9%	
Presence of hot meals in daily consumption	Yes	74.4%	82.2%	87.7%	81.4%	$\chi^2=14.97$ $p=0.00477$
	No	5.3%	1.7%	2.0%	2.9%	
	Sometimes	20.3%	16.1%	10.3%	15.7%	
Proper nourishment (self evaluation by respondents)	Yes	54.6%	52.7%	54.4%	53.7%	$\chi^2=0.22$ $p=0.89429$
	No	45.4%	47.3%	45.6%	46.3%	
Shift-work as the cause of irregular food consumptions	Yes	63.3%	65.1%	70.3%	66.0%	$\chi^2=2.36$ $p=0.30702$
	No	36.7%	34.9%	29.7%	34.0%	
Number of warm meals consumed by respondents	1	56.8%	52.3%	43.6%	50.9%	$\chi^2=10.77$ $p=0.02924$
	2	40.0%	38.7%	45.4%	41.0%	
	3 and more	3.2%	9.0%	11.0%	8.1%	

**Table 3.** Regular food consumption, presence of hot meals in daily consumption, proper nourishment, shift-work as the cause of irregular food consumptions according to self-assessment, number of warm meals consumed by respondents, shift-work as the cause of incorrect nourishment of shift work marked as the cause of health deterioration

		Shift work marked as the cause of health deterioration.			Statistic
		Yes	No	Summary	
Regular food consumption	Yes	32.0%	53.0%	40.0%	$\chi^2=38.43$ $p=0.00001$
	No	47.5%	25.6%	39.1%	
	Sometimes	20.5%	21.4%	20.9%	
Presence of hot meals in daily consumption	Yes	80.2%	83.5%	81.4%	$\chi^2=1.18$ $p=0.55362$
	No	3.0%	2.6%	2.9%	
	Sometimes	16.8%	13.9%	15.7%	
Proper nourishment (self evaluation by respondents),	Yes	43.6%	70.3%	53.7%	$\chi^2=47.47$ $p=0.00001$
	No	56.4%	29.7%	46.3%	
Shift-work as the cause of irregular food consumptions according to self-assessment	Yes	81.3%	41.0%	66.0%	$\chi^2=119.71$ $p=0.00001$
	No	18.7%	59.0%	34.0%	
Number of warm meals consumed by respondents	1	55.0%	44.4%	50.9%	$\chi^2=6.91$ $p=0.03153$
	2	38.3%	45.3%	41.0%	
	3 and more	6.7%	10.3%	8.1%	
Shift-work as the cause of incorrect nourishment	Yes	76.3%	43.0%	68.2%	$c^2=30.53$ $p=0.00001$
	No	23.7%	57.0%	31.8%	

## DISCUSSION

Shift-work determinates irregular nutrition habits. The quality, as well as quantity, of meals consumed by shift-workers can significantly influence their health [11, 12].

Food Safety in Poland is regulated by many legal acts, both national and those of the EU [13].

Shift workers doing their work underground are hampered in the ability to consume warm food and at specified times. The following dissertation is an attempt to show how shift workers working underground cope with regular consumption of meals during the day, including hot meals.

Conducted studies in which almost half of respondents consider their nutrition habits as inappropriate (46.3%) confirms conclusions stated above. Among those, more than half of interviewees (68.2%) pointed to shift work as the reason for their irregular nutrition habits. Such an opinion was declared by the oldest workers (78.6%) and the number decreased along with lower age. More than half of questioned (66.0%) reported that shift – work makes it difficult to eat regularly.

Time and number of consumed meals also depend on cultural and social factors [14, 15].

People who do shift – work, especially night work, eat sandwiches more often than those who work on one shift [16].

Shift workers are at the higher risk of health problems associated with non – typical and simple nutrition customs [17, 18, 19].

In the research, which refers only to shift – workers, it was observed that people doing shift work eat usually from 2 to 5 meals per day [20].

Most studies agree that shift work affects the distribution of food intake over 24 h and the selection of food items. In summary, shift workers preferred to eat cold food and fast food; fewer of them eat hot food: they tend to nibble rather than have a meal, and have fewer meals [10].

Conducted studies showed that respondents mostly eat one warm meal per day. The highest percentage of those who declared eating warm meals referred to men at the age of 41–50 years old (86.5%) that did shift work for over 21 years (87.7%).

Most of Poles consider their eating habits as healthy one (65.0%) or even as very healthy (8.0%). Those who consume at least 3 meals per day were taken as people who follow healthy eating habits. People from the oldest group age (above 55 years old) eat the healthiest. Worse results were observed in the group of thirty years old respondents, among which only 8% follow healthy eating habits [21].

Other results were obtained in self – prepared studies, where nearly half of interviewees ate regularly. Significantly, affirmative answers were given mostly by the youngest people at the age of 21–30 (50.0%). Also men at the age of 31–40 declared consumption of regular meals (27.0%). Workers at the age of 41–50 referred to the group which consumes meals the least regularly (40.8%).

It has also been reported that the total energy and nutrient intakes increase when individuals eat with others; however, shift workers have fewer opportunities to take meals with their families and friends [10].

The authors speculate on the mechanisms that might underlie this association, which include disruption of the circadian rhythms that regulate metabolic and cardiovascular systems, a negative effect on diet and exercise, and an effect on both quality and quantity of sleep.

Although some of the effects of shift work are probably unavoidable (such as disruption of circadian rhythms, although even this effect can be ameliorated somewhat by careful management of shifts), others, such as eating patterns, are obvious targets for intervention. It would, however, require a change in thinking and an acceptance that occupational health needs to move into territory more personal than before: the diet of workers [22].

## CONCLUSIONS

Shift work makes nourishment and regular consumption difficult. It contributes to the limited amount of warm meals eaten during the day.

In order to maintain preventive health care and the improvement of quality of life, shift workers should be provided with an easier access to meals (including warm one) at specified times of the day.

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