

**A Study on Impact of Food Provided by Canteen on the Health of Workers, in A Beverage Company in Bangalore-Cross Sectional Study****Shanthi. M<sup>1</sup>, Tejashwini K<sup>2</sup>, Prashanth Hungund<sup>3</sup>, Rajesh Gowda M<sup>4</sup>, Nandeesh Venkatappa<sup>5</sup>**<sup>1</sup>Associate Professor Department of Community Medicine Akash Institute of Medical Science and Research Centre, Bengaluru, Karnataka, India<sup>2</sup>Associate Professor Department of Community Medicine, Dr B R Ambedkar Medical College, Bengaluru, Karnataka, India<sup>3</sup>Consultant Urologist, People Tree Hospital, Bangalore, Karnataka, India<sup>4</sup>Factory Medical Officer, Kennametal India Ltd, Bengaluru, Karnataka, India<sup>5</sup>Associate Professor of Nephrology, Adichunchanagiri Institute of Medical Sciences, BG Nagara, Nagamangala taluk, Mandya district, Karnataka, India

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Conflict of interest: Nil

**Abstract:****Background and Objectives:** of the study was to assess quality of the food provided in an industrial canteen and impact of the same on the worker's health.**Methods:** A cross sectional, observational, study was conducted on a industrial canteen in a beverage company in Bangalore. Data was collected using a pretested questionnaire. And then it was entered into MS excel sheet 2010. Data compilation and analysis was done using SPSS Version 16. Study variables were body mass index (BMI), Waist circumference (WC). And dietary intake at lunch obtained by 24 hrs dietary recall.**Results:** Majority of the participant were PUC/diploma holders 66% followed by high school diploma holder 22% Graduate (8%), Primary (4%). Among study participant 56% belonged to nuclear family & 44% to joint family. In the study majority 64% were nonvegetarian & 36% were vegetarians. All participants consumed cereals, pulses green leafy vegetables and milk daily will non vegetarians consumed flesh weekly. In the present study 40% of the study participants consumed junk food, 60% were alcoholic, 50% of them were smokers. In the present study 42% were overweight and obese, 4% underweight according to BMI. 92% of the study participants had central obesity based on WHR. Conclusions: Nutritional status was dependent on the type of food provided in the canteen, and Central obesity was a rampant feature.**Keywords:** Food pattern, Nutritional status, factory workers, canteen WHR, BMI.This is an Open Access article that uses a funding model which does not charge readers or their institutions for access and distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>) and the Budapest Open Access Initiative (<http://www.budapestopenaccessinitiative.org/read>), which permit unrestricted use, distribution, and reproduction in any medium, provided original work is properly credited.**Introduction**

Food and Nutrition are recognized as human rights in the Universal Declaration of human rights in the international convention on economics, social and cultural rights. This necessity for correct and adequate feeding of industrial workers has been reflected in the Factories Act of, 1948, which requires the provision of a canteen in all factories employing more than 250 persons. Also, he may have to educate the workers by publicity and personal instruction. It is proposed, therefore, to go briefly through the main factors necessary to a satisfactory diet and to mention some of the effects of deficiencies. In general, these will be confined to the effects of minor deficiency as the effects of major defects are less commonly seen in this country and also are comparatively well known. Lastly, some of the causes of malnutrition will be considered and a few of the problems facing industry

will be discussed. The main constituents of a diet are the following: Water, The energy value (measured in calories), Carbohydrate., Fat, Protein, Salt, Vitamins [7]

If a diet is insufficient the weight falls, there is weakness and fatigue, and the person feels the cold more than before. After a time, the body learns to use food more economically and also bodily movements are economized. In most cases of starvation other dietary deficiencies will be present as well, showing their characteristic signs and symptoms. When the carbohydrate and fat resources of the body have been used up the body lives on its proteins. This has been suggested as the reason for the lowered resistance to some infections such as tuberculosis. The provision of an adequate amount of food for energy must always be the first consideration in planning a diet [13]

The first is what meals and at what frequency should meals be provided at the factory? It would seem probable that a meal or snack every 21 or 3 hours is the most desirable. This should help to maintain efficiency by preventing a fall in blood sugar which may occur several hours after a meal, and it might help also to reduce the incidence of peptic ulcer which is at present very high and a cause of much disability and absenteeism. It is suggested, therefore, that facilities should be available for obtaining

Breakfast; (2) a mid-morning snack; (3) a midday full meal; (4) an afternoon snack or tea; (5) an evening meal for. Equivalent arrangements for feeding night workers should be arranged. Many night workers should be encouraged to eat during the working hours and sleep in the day, and good canteen facilities will be an incentive to do so. The food value of the meals provided is of some importance. Inasmuch as the midday meal is the main meal of the day for most people it should provide 1000-1500 calories, two-thirds or more of the vitamin and mineral salt requirements and a considerable proportion-at least one-third-of the protein requirements. Whilst it might be desirable to have some of these factors more evenly distributed over the other meals, one must remember that it is the habit of many to have ragi balls and stew as almost their only other food. Other canteen meals may be mainly calorie producing, though opportunity should be taken to introduce vitamins, salts and proteins when possible. The canteen should also aim at providing special diets for certain persons suffering from diseases such as peptic ulcer, diabetes and cholecystitis. Special consideration should be given to the meals available for juveniles in view of their high requirements of protein, calcium, iron and vitamins, and if possible, they should be provided free or cheaply. In addition to

providing sound meals, it will be found necessary to encourage people to use the canteen. [6,7]

The present study was conducted among workers of beverages industry in Bangalore to assess the nutritional aspect of food provided at industrial canteen

The present study was proposed with the objective to assess quality of the food provided in an industrial canteen and to assess effect of food intake on the worker's health.

### Materials and Methods

A Cross sectional study done on employees in a beverage industry in Karnataka during April & May 2019. Employees working in First and Second shift and having food in canteen and those employees willing to co-operate were included in the study details. People working in night shift, administrative and HR department were excluded from study.

Self-structured peer reviewed pre tested questionnaire comprising of socio demographic profile, years of experience, 24hr recall of diet consumption. Nutritional status assessment was done measuring height, weight, waist circumference, hip circumference. And the anthropometric indices' like BMI, Waist Hip ratio were calculated.

All the subjects were informed about the purpose of study and a written informed consent was obtained prior to participation in the study. Then employees were asked about the questionnaire and the anthropometric measurements were collected. Then the data was entered in MS excel sheet 2010. Data compilation and analysis was done using SPSS 17 version. Proportions and percentages were used to interpret the results.

### Results

**Table 1: Socio-economic status of the industrial workers**

Characters	Sedentary		Moderate		Heavy	Total
	N9	%	N 141	%	0	
<b>Age</b>						
<30	3	2	45	30	0	48
30-40	3	2	42	28	0	45
>40	3	2	54	38	0	57
<b>Education</b>						
Illiterate	0	0	0	0	0	0
Primary	0	0	6	4	0	6
High School	3	2	30	20	0	33
PUC/DIPLOMA	3	2	96	64	0	99
Graduate	0	0	12	8	0	12
<b>Type of Family</b>						
Nuclear	6	4	78	52	0	84
Joint	3	2	63	42	0	66
Extended	0	0	0	0	0	0
<b>Source of Income</b>						
Main	9	6	138	92	0	147
Subsidiary	0	0	3	2	0	3

In the present study out of total 50 study subjects 32% were in the age group of less than 30yrs, 30%

were in the age group of 30-40yrs, 38% were more than 40. In the present study majority (66%) were

PU/Diploma holder, followed by high school (22%), Graduate (8%), Primary (4%) In the present study 56% belonged to Nuclear family & 44% belonged

to Joint family In the present study 98% claimed salary has the main income.

**Table 2: Dietary pattern of the industrial workers**

Food Pattern	Category					
	Sedentary		Moderate		Heavy	Total
	N9	%	N 141	%	0	150
<b>Meals Consumed Per Day</b>						
Twice	0	0	3	2	0	3
Thrice	9	6	126	94	0	135
Four Times	0	0	12	8	0	12
<b>Food Habits</b>						
Vegetarian	3	2	51	34	0	54
Non-Vegetarian	9	6	87	58	0	96

In the present study out of total 50 study subjects 64% of them consumed mixed diet, 36% of them are vegetarians. In the present study 90% of them

consumed 3 meals a days 8% of them consumed 4 meals a day & 2% consumed 2 meals a day.

**Table 3: Meal pattern of the workers**

	Meal	Menu
Canteen	EARLY MORNING(8.00AM-9.30AM)	IDLI/LEMON RICE/BONDA/CHATNI /SAMBAR/DOSA/UPMA/RICE BATH/ PULIOGARE/RAVA IDLI
	TEA BREAK	TEA/COFFEE
Food Provided By Industry Run Canteen	LUNCH (1.00PM-2.00PM)	CHAPPATHI/RAGI BALL/PORI/RICE/SAMBAR/RASAM/CURD/VEGITABLE PALYA/ SAGU/PAPAD/SWEET
	SNACKS WITH TEA (4.00PM TO 5.00PM)	BUN/ PUFF/NIPATTU TEA/COFFEE
Home	DINNER (9.00PM-10.00PM)	CHAPPATHI/RAGI BALL/PORI/RICE/SAMBAR/RASAM/CURD/VEGITABLE PALYA/ SAGU/PAPAD/SWEET
Midnight Snack	10.30 PM	TEA/COFFEE/ BISCUITS

In the present study subjects consumed menu as per the above table based on their respective shift in a beverage industrial canteen

**Table 4: Frequency of consumption of food groups by the workers**

Food Items	Category	Sedentary		Moderate		Heavy	Total
		N9	%	N 141	%	0	
Cereals	Daily	9	6	141	94	0	150
	Weekly	0	0	0	0	0	0
	Occasionally	0	0	0	0	0	0
Pulses	Daily	9	6	141	94	0	150
	Weekly	0	0	0	0	0	0
	Occasionally	0	0	0	0	0	0
Green Leafy Vegetables	Daily	6	4	144	96	0	50
	Weekly	0	0	0	0	0	0
	Occasionally	0	0	0	0	0	0
Roots And Tubers	Daily	3	2	48	32	0	51
	Weekly	6	4	93	62	0	99
	Occasionally	0	0	0	0	0	0
Others	Daily	9	6	123	82	0	132
	Weekly	0	0	18	12	0	18
	Occasionally	0	0	0	0	0	0
Milk And Milk Products	Daily	9	6	138	92	0	147
	Weekly	0	0	3	2	0	3
	Occasionally	0	0	0	0	0	0
Sugar And Jaggery	Daily	9	6	132	88	0	141
	Weekly	0	0	9	6	0	9
	Occasionally	0	0	0	0	0	0
Oils	Daily	6	6	138	92	0	147

	Weekly	0	0	3	2	0	3
	Occasionally	0	0	0	0	0	0
<b>Fruits</b>	Daily	6	4	39	26	0	45
	Weekly	3	2	102	68	0	105
	Occasionally	0	0	0	0	0	0
<b>Egg</b>	Daily	3	2	9	6	0	12
	Weekly	3	2	81	70	0	84
	Occasionally	0	0	0	0	0	0
<b>Fleshy Food</b>	Daily	0	0	6	4	0	6
	Weekly	0	0	63	42	0	63
	Occasionally	3	2	24	16	0	27

In the present study, all the study participants consumed cereals, pulses and green leafy vegetables daily, 34% of them consumed roots & tubers daily, 66% weekly. 88% of them consumed other vegetables daily, 12% weekly. 98% of the study participants consumed milk and its products daily,

2% weekly, 94% of them consumed sugar daily, 6% weekly. 98% Consumed oil daily, 2% weekly, 30% consumed fruits daily, 70% consumed weekly. Most of the mixed diet study participants consumed egg and fleshy foods weekly.

**Table 5: Dietary intake of the industrial workers**

Groups	RDA	Adequate Intake	Excess	Inadequate
<b>Cereals And Millets</b>	460	51	39	60
<b>Pulses</b>	40	72	60	18
<b>Green Leafy Vegetables</b>	60	78	18	54
<b>Roots And Tubers</b>	40	93	0	57
<b>Others</b>	50	75	12	63
<b>Milk</b>	150	87	0	63
<b>Sugar</b>	30	123	27	0
<b>Oil</b>	40	99	21	30
<b>Fruits</b>	200	111	15	24
<b>Egg</b>	30	90	0	6
<b>Flesh</b>	30	45	21	30

In the present study 40% are taking inadequate cereals, 40% are consuming excess pulses, 36% inadequate green leafy vegetables 38% inadequate

roots and tubers, 42% were consuming less other vegetables and milk & its products. 14% of study participants consumed excess oil.

**Table 6: Non-Food Habits of the Industrial Workers**

Non-Food Items	Category	Sedentary		Moderate		Heavy	Total
		N9	%	N 141	%		
<b>Junk</b>	Daily	3	2	45	30	0	48
	Weekly	0	0	6	4	0	6
	Occasionally	3	2	3	2	0	6
<b>Alcohol</b>	Daily	3	2	39	26	0	42
	Weekly	3	2	42	28	0	45
	Occasionally	3	2	0	0	0	3
<b>Smoking</b>	Daily	3	2	60	40	0	63
	Weekly	0	0	12	8	0	12
	Occasionally	0	0	0	0	0	0

In the present study, 40% of the study participants consumed junk food, 60% were alcoholic, 50% of them were smokers.

**Table 7: Distribution of subjects according to anthropometric indices**

Anthropometric Indices	Sedentary		Moderate		Heavy		Total
	N9	%	N 141	%	0	0	
<b>Body Mass Index</b>							
<b>Undernourished (&lt;18.5)</b>	0	0	6	4	0	0	6
<b>Normal (18.5-24.9)</b>	6	4	72	48	0	0	78
<b>Overweight (25.0-29.9)</b>	3	2	45	30	0	0	48
<b>Obesity (&gt;30)</b>	0	0	15	10	0	0	15
<b>Waist-To-Hip Ratio</b>							
<b>Normal</b>	0	0	12	08	0	0	12
<b>Obese</b>	09	06	129	86	0	0	138

In the present study 42% were overweight and obese, 4% underweight according to BMI. 92% of the study participants were obese based on WHR.

### Discussions

Food selection and intake is a multifactorial behaviour influenced by affordability and the food culture prevalent. Food studies have demonstrated that family income positively correlates the frequency and quantity of consuming protective foods and energy foods. Although knowledge about foods and their requirements play an important role in food selection, since there is a close association between food intake behaviours and Nutritional Status of people, it is apparent that such data help to assess risk factors in the development of non-communicable disease in the given community [19]

Results presented in table 1 revealed that 32% were in the age group of less than 30yrs, 30% were in the age group of 30-40yrs, 38% were more than 40yrs similarly study conducted by Harish N[5] majority of workers belonged to the age group of 25-50yrs. followed by 27% in less than 25yrs and 14% greater than 50yrs. In present study majority (66%) of the subjects were PU/Diploma holder, followed by high school (22%), Graduate (8%), Primary (4%), in similarly study conducted by Harish N[5] 25% are diploma holders 20% were graduates and 17percent were post graduates. In the present study 56% belonged to nuclear family & 44% belonged to Joint family. In similarly study conducted by % Harish N<sup>5</sup> 71% belonged to nuclear family. In the present study of 98% claimed salary has the main income. In similarly study conducted by Harish N[5] 91% claimed salary has main source of income.

Results presented in table 2 revealed that 64% of them consumed mixed diet, 36% of them are vegetarians In similar study conducted by Archana Prabhat et al [2] 18.3% were vegetarians 81.7% consumed mixed diet. In another study conducted by Harish N[5] 74% were non vegetarian 26 vegetarian In the present study 90% of them consumed 3 meals a day 8% of them consumed 4 meals a day & 2%

consumed 2 meals a day. in similarly study conducted by Harish N[5] 96% of workers consumed 4 meals a day and only 6% consumed 3 meals a day.

Table 3 revealed daily meal pattern of industrial workers. Meal of industrial worker includes Ragi ball, chapathi, with vegetable palya, sambar, rasam rice papad, pickle, curd in daily diet as per frequency of consumption different food items such as cereals pulses green leafy vegetables followed by root and tubers, Fruits and milk and milk products oil and fats, egg and fleshy food are consumed by industrial worker.

Results presented in table 4 revealed that participants consumed cereals, pulses and green leafy vegetables daily, 34% of them consumed roots & tubers daily, 66% weekly, 88% of them consumed other vegetables daily, 12% weekly. 98% of the study participants consumed milk and its products daily, 2% weekly, 94% of them consumed sugar daily, 6% weekly, 98% Consumed oil daily, 2% weekly, 30% consumed fruits daily, 70% consumed weekly. Most of the mixed diet study participants consumed egg and fleshy foods weekly.

In a similar study conducted by Harish N[5], 100% of them consumed cereals and pulses daily, 54% of them consumed green leafy vegetables daily, 43% consumed occasionally, 3% daily. 62% of the participants consumed roots and tubers daily, 21% occasionally, 17% weekly. 48% of the study participants consumed fruits weekly, 45% daily. 88% of the study participants consumed milk and milk products daily, 12% consumed weekly. 49% of the study participants consumed nuts and oils day, 31% consumed weekly, 20% occasionally. 61% consumed oil daily, 35% consumed weekly. 82% consumed fleshy foods weekly, 80% consumed occasionally.

In another study conducted by Archana Prabhat et al <sup>2</sup> consumed cereals daily, and pulses were consumed 2 times a week. 44% Consumed green leafy vegetables, 48% consumed weekly, 66% consumed

fruits daily, 21% consumed monthly, 8% consumed daily. 93% of the study subjects consumed milk daily. 70% of the participants consumed sea food daily.

In the present study table 5 revealed 40% of the study participants are taking inadequate cereals, 40% are consuming excess pulses, 36% inadequate green leafy vegetables, 38% inadequate roots and tubers, 42% were consuming less other vegetables and milk & its products. 14% of study participants consumed excess oil.

In a similar study conducted by Harish N[5], 74.66% consumed adequate cereals, 53.33% consumed adequate pulses, 70%, 63.5, 98% consumed adequate GLV, other vegetables and fruits respectively.

In the present study table 6 revealed 40% of the study participants consumed junk food, 60% were alcoholic, 50% of them were smokers.

In a similar study conducted by Harish N<sup>5</sup>, 40% alcoholics, 50% were smokers.

In the present study table 7 42% were overweight and obese, 4% underweight according to BMI. 92% of the study participants had central obesity based on WHR.

In a study conducted by Harish N[5], 74% were overweight and obese based on BMI, 81% were obese based on WHR. In another study conducted by Sujata Maiti Choudhury et al [4] is noteworthy that BMI of tribal women were low 98% workers is significantly low compared to non-tribal 68% women workers.

### Conclusion

The outcome of the study; anthropometric measures of the nutritional status in the selected industrial workers they were suffering from over nutrition and health problems. But it was noteworthy that most of the respondents were having normal nutritional status. Diagnosis disorders were more of overweight arthritis and joint pain. Hence, greater need to be taken to manage chronic disorders through diet and healthy lifestyle. Thereby reducing the risk posed by chronic disorders. Factors like obesity, stress are important contributory factors, smoking; reduced physical activity and hypertension are also strong risk factors.

Education material was found useful in maintaining good health. Regular exercises have several advantages when combined with reduced food intake; it helps in reduction of body weight, serum lipids, elevation of HDL cholesterol fraction and better insulin sensitivity. Walking is the most useful and advocated in diabetic patients.

The study outcome therefore strongly recommends periodic education of industrial workers through literature to combat and prevent health disorders and

thereby achieve sustainable health which also contributes to improved productivity and thereby economy of the nation.

### Recommendations

The prevalence of Overweight and obesity was 42% among the industrial workers. This is a very high percentage compared to national average[15]. In order to achieve any substantial change the eating habits and there by BMI of the industrial workers it is not enough to merely provide nutritional information on the meals.

There should be some intervention in the food supply. Like increase in the quantity and frequency of green leafy vegetables provided in the menu. Menu should contain foods which are rich in protein but area also affordable like pulses and soya. Limitation of calorie intake by decreasing intake of carbohydrate rich food like rice and Fat rich food like samosa and pakodas.

Management and worker union along with the participation of workers should strive to improve the overall health of the individual by participating in activities like Yoga and aerobics.

Restrict in junk food provided in the menu. Provide at least one fruit serving in the menu every day. The financial aspect is crucial in selection of food made by worker so, in order to be effective no nutritional action entails any economic overhead.

Creating awareness and making them self-sufficient in modifying food behaviour and lifestyle pattern within their accessible environment should be included as an intervention strategy in the regional programmes.

### Limitations

The limitations of study are inadequate sample size due to time constraint, so statistical impact of the same on the worker's health tools like chi square test was not used in data analysis which is main drawback of study. Since it was cross sectional study, cause and effect could not be analysed. Micronutrients were not assessed due to lack of time and resources. Qualitative study was also not conducted due to time constraint.

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