What We Eat and Where We Work Is What We Become: Worksite Food Environment Exposure and Cardio-Metabolic Health among Employed Adults of Urban Delhi, India

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Summary The incidence of metabolic syndrome (MS) which is a predictor of increasing CVD is on the rise among adults in urban India. The present study was designed to measure the prevalence of cardio metabolic risk (CMR) as per MS among employed adults in Delhi, India. Study design was cross-sectional. Anthropometric and biochemical measurements were carried out using standard techniques on apparently healthy males and females (n = 455) working in various government and private organisations in Delhi, India after obtaining ethical permissions. It was found that more than one-third of the study population had MS (43.8%). A significant difference in the prevalence of MS was seen among males (34.7%) and females (57.5%, p < 0.05). The prevalence of MS components was: abdominal obesity (54.3%), hypertriglyceridemia (61.9%), hypertension (56.6%), hypertriglyceridemia (27.4%), low HDL-c levels (63.7%). CMR (assessed from 0–5, where 0 means no MS). It was found that CMR increased with age (β: 0.01; 95% CI: 0.009, 0.01; p = 0.000) especially among females (β: 0.29; 95% CI: 0.19, 0.38; p = 0.000) who were consuming frequent non-vegetarian foods (β: 0.04; 95% CI: 0.01, 0.09; p = 0.07), had family history of diseases (β: 0.08; 95% CI: 0.01, 0.18; p = 0.09) and were sedentary workers (β: 0.05; 95% CI: 0.00, 0.10; p = 0.06). Unhealthy worksite food environment characterised by high fast food outlet density (β: 0.003; 95% CI: 0.00, 0.007; p = 0.04) in close proximity (β: 0.17; 95% CI: 0.36, 0.00; p = 0.05) to worksite were also associated with MS. There is a high prevalence of individual components of MS and overall prevalence of MS. Food environment and physical inactivity were two paramount factors resulting in increased CMR among the study population.

Key Words cardio-metabolic risk, metabolic syndrome, food environment, obesity

Most of the young adults are the productive workforce of the community and spend a sizeable amount of their time working daily. They tend to consume one or more meals at their workplace (1, 2). Work has a central role in the lives of majority of adults and worksite is an important environment which could affect the food choice, dietary behaviour among working age adults, since they spend on an average eight hours at their worksite on every weekday (3, 4).

Out of home meals have grown in popularity all over the world including India. Since they comprise an increasingly significant proportion of people’s total energy intake, their nutritional quality has become a concern in the public health sector (5, 6). The most common way of eating out of home for working adults is at worksite environment.

Meals at work influence productivity of the employees and their risk of occupational conditions such as obesity, hypertension, diabetes, cardiovascular disease and cancer. In fact, unhealthy workplace eating behaviour is believed to be playing a role in the burgeon-
Anthropometric measurements including height, weight and waist circumference were carried out, blood samples were collected for lipid profile (total cholesterol, triglycerides, HDL, and LDL) and fasting blood glucose along with blood pressure measurements by a trained technician. As the study involved in-depth interviews and collection of data on diet, lifestyle, anthropometry, blood pressure measurements and biochemical assessments, therefore, permission to carry out the research was obtained from the concerned authorities and individuals in different organizations after explaining them the purpose of the study. Ethical Approval for the study was obtained from Institutional Ethics Committee of Institute of Home Economics, University of Delhi.

The data collected were subjected to both qualitative and quantitative analysis using the Statistical Package for the Social Sciences (SPSS), Windows software, version 21.0 and Microsoft excel 2010.

RESULTS

Out of the total 455 participants, 276 were males and 179 were females in the age group of 25–55 y with mean age of 41.43±9.8 y. Socio-demographic profile revealed that subjects in the present study were well educated and well qualified adults, who were gainfully employed in varied professions like executives, teaching professionals, researchers, management, finance etc. Majority belonged to affluent sections of the society, living in nuclear or joint families with a family size of 3–4 members. Data indicated that non-vegetarians (42.6%) were more common in comparison to vegetarians (38.9%) or ovo-vegetarians (18.5%) among the study population. More than half of the subjects were skipping meals (51.6%).

Lifestyle practices of the subjects revealed that majority of the subjects (82.4%) were non-smokers. It was found that almost 37.8% of the subjects were consuming alcohol. Fifty percent of subjects had family history of lifestyle diseases.

Based on the anthropometric parameters, the mean BMI of the study population was calculated to be 24.65±3.83 kg/m². According to the Asian classification for BMI, almost half of the population was obese (48.4%) and 18.2% of subjects were found to be overweight.

Sex-wise percentage distribution of the subjects depicted that a higher percentage of females (52.0%) were in the obese category in comparison to males (46.0%), 16.8% of females and 19.2% of males were overweight. Figure 1 depicts BMI distribution among males and females of the study population and it was found that a higher percentage of females (52.0%) were in the obese category in comparison to males (46.0%) whereas a greater number of males were overweight (19.2%) in comparison to females (16.8%). Thirty percent of the subjects were normal and 3.3% of the subjects were found to be underweight among the study population.

In the present study, the waist circumference data was interpreted as per the Asian cut-offs (8). The mean overall waist circumference among males was 90.51±7.48 cm and among females was 84.59±10.30 cm respectively. Based on classification of waist circumference as per the two action levels given by Misra et al. (8), it was seen that only 3% of the total subjects had normal waist circumference.

The mean SBP and DBP of the study population was 130.40±17.23 mm Hg and 83.47±12.30 mm Hg respectively. The mean values of BG were also very high with 99.66±45.45 mg/dL. Mean TC levels of the study population was 174.14±30.22 mg/dL and overall mean triglycerides were 171.35±58.55 mg/dL. HDL levels among males and females were almost similar with mean value of 41.86±6.18 mg/dL and 42.34±6.15 mg/dL and mean LDL values were 96.78±27.84 mg/dL.

It was found that majority (79.3%) of the apparently healthy adults were dyslipidemic with one or more risk factors higher than the set cut-off values as per NCEP-ATP III guidelines (9). The present study highlights a degrading scenario of heart health among the young and middle-aged employed adults, as these participants were unaware of their dyslipidemic status before and were living an unhealthy life which resulted in high prevalence of dyslipidemia.

The prevalence of metabolic syndrome (MS) among study participants was done on the basis of NCEP-ATP III Criteria (9). It was found that almost 44% of the study population had MS. Significant difference for prevalence of MS among males and females was found with 57.5% of females suffering from MS in comparison to 34.7% of males. Figure 2 depicts the prevalence of individual components of MS among the study population.

The contributions of different components of the metabolic syndrome differed as evident from Fig. 2 and Table 1. Almost one fourth of the subjects were suffering from 2 risk factors and were right on the brink of falling prey to MS. Only 7.4% of the study population were healthy, with no symptoms of MS.

Significant difference for prevalence of MS among males and females was found with 57.5% of females suffering from MS in comparison to 34.7% of males.
Contribution of several MS components were also reported higher in females in comparison to males. In women, elevated BMI, low HDL cholesterol, increased waist circumference and hyperglycaemia were significantly larger contributors to the metabolic syndrome while in men these were hypertension and elevated triglycerides (10).

Our study showed a high prevalence of metabolic syndrome (MS) and cardiometabolic risk factors. Low HDL levels (63.7%) and hypertriglyceridemia (61.9%) were the most common risk factors among the study participants followed by hypertension (56.6%), abdominal obesity (54.3%) and hyperglycaemia (27.4%). The probable reason of such high prevalence of MS and CMR factors among the study population was physical inactivity and prolonged sitting during the office hours among the subjects as their job profile is less physically active (Fig. 2).

To study the worksite food environment, density of fast food outlet (FFO) within the 2-km radius was found out. The Fast Food Environment Index (FFEI) was calculated by dividing the total number of fast-food outlets with the total number of different types of food outlets (fast food outlets, cafeterias, sweet corners, bakery, food stalls, confectionaries, general stores, convenience stores, sit-down, full-service restaurants, hotels, supermarkets, grocery stores) situated within 2 km radius of the worksites. Number of FFO ranged from 4 to 12 within 2 km radius. Worksites with no canteens had higher density (0.64 ± 0.06) of FFO in comparison to worksites with in-house canteens (0.46 ± 0.12; p = 0.000). Higher FFO density among worksites indicates that the environment is less supportive of healthy living due to clustering of FFO over healthy options like supermarket, grocery store etc. around the neighbourhood in comparison to other worksites.

Subjects were frequently consuming fast foods with poor nutrient quality and high fat, sugar and salt. Correlation and multiple regression analyses were conducted to examine the relationship between anthropometric and biochemical parameters and various potential predictors, where the model was adjusted only for age and sex. Based on the regression model (Table 2) it was found that CMR increased with age (β: 0.01; 95% CI: 0.009, 0.01; p = 0.000***). Females (β: 0.29; 95% CI: 0.19, 0.38; p = 0.000) had high CMR factors in comparison to males. Subjects who were consuming frequent non-vegetarian food (β: 0.04; 95% CI: −0.01, 0.09;
had family history of non-communicable diseases (β: 0.08; 95% CI: −0.01 to 0.18; p=0.09) and were working in educational/research/HR departments (β: 0.05; 95% CI: −0.00 to 0.10; p=0.06) had high CMR risk. High FFO density (β: 0.003; 95% CI: 0.00.0007; p=0.04), increased number of FFO outlets (β: 0.01; 95% CI: 0.00.03; p=0.04), close proximity (β: −0.17; 95% CI: −0.36 to 0.00; p=0.05) of FFO to the work environments which were easily accessible to the study population were some of the factors which made the work environment unhealthy resulting in clustering of CMR factors among the study participants (Table 2).

**DISCUSSION**

Many studies have reported a high prevalence of metabolic syndrome or its individual components like diabetes, impaired glucose tolerance, obesity and hypertension among Indian population. Deedwania et al. (11) conducted multicentric study in 11 different cities of India and found that the prevalence of metabolic syndrome was 30.3% among males and 40.4% among females. Prevalence of MS was significantly greater in subjects with highest vs. lowest categories of education (45 vs. 26%), occupation (46 vs. 40%), fat intake (52 vs. 45%), sedentary lifestyle (47 vs. 38%) and body mass index (66 vs. 29%) (p<0.05) as per the findings of Deedwania et al. (2014). In the present study as well, it was observed that among the demographic factors, age and sex were significantly associated with anthropometric and biochemical parameters of the subjects. In accordance with the literature, it was seen that CMR increases with age in the present study too.

In addition, unhealthy worksite environment governed by increased fast food outlet density was also a crucial predictor of CMR. Participants with prolonged sitting time during the working hours, who were frequently consuming energy dense meals, had a positive family history of non-communicable diseases like obesity, hypertension, diabetes and heart diseases were at greater risk of developing CMR. Poor dietary and lifestyle habits due to exposure to unhealthy working environment and a sedentary job profile over a long period of time has resulted in clustering of MS risk factors among both males and females, highlighting the need for collaborative corrective action and intervention for the study population to combat lifestyle-based diseases.

**Disclosure of state of COI**

No conflicts of interest to be declared.

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