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INTERACTION OF CHANGING FOOD ENVIRONMENT WITH FOOD CONSUMPTION PATTERNS

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ABSTRACT

The paper presents important insights into the food consumption patterns that are changing with time and the role played by the food environment in altering the intake patterns and thereby the health outcomes. There is a transition in the consumption patterns among individuals all over the world towards energy dense, high fat, high sugar and salt, processed and ready to eat foods. This shift and the role played by the food environment in changing the consumption patterns has brought about adverse effects on the health of the people making them more prone to obesity and other degenerative diseases. Studies suggest that there is a need for formulating policies that would aim at promoting healthy food consumption patterns by educating the consumers and creating awareness about the adverse effects of eating unhealthy foods. Appropriate strategies are also needed to make positive changes in the food environment and thus the consumption patterns.

Key words: Food consumption patterns, food environment, obesity, degenerative diseases, food policies.

INTRODUCTION

The food consumption patterns have been changing all over the world. Dietary changes accompanied by changes in lifestyle have been held responsible for increasing the risk of non-communicable diseases even in the poorest countries. The adverse changes include shift towards energy dense diets, with a greater role for fat and added sugars in foods, increased intake of saturated fats (that are mostly from animal sources), and a reduced intake of complex carbohydrates, dietary fibre, fruits and vegetables in the diet (Drewnowski and Popkin 1997). Diets change because of many influencing factors and complex interactions. Income, individual preferences, beliefs, traditions, as well as geographical, environmental, social and economic factors, all relate in a complex manner to influence our dietary consumption patterns (WHO/FAO 2003). In India also, the patterns of consumption have been changing as a result of rapid growth in economy and general rise in the income levels. Worldwide, there has been a change in food preferences moving away from cereals, fruits and vegetables.There is an increased prevalence of overweight and obesity among children, adolescents (Ogden et al, 2002) and adults (Hedley et al, 2004) all over the world due to the changes in the intake patterns. Obesity is one of the leading diet related public health problems in the world. Many epidemiologic studies have also focused on the effects of the food environment on health and body weight status (Lamicchhane et al, 2012; Morland et al, 2006; Jeffery et al, 2006; Mujahid et al, 2008; Morland and Evenson 2009).

Hence, it becomes vital to keep a check on the changes in consumption pattern and its effects on health. There is an urgency to devise policies addressing the influences of environment on consumption patterns and consequently health. The present paper provides a comprehensive review of the research done on the changing food consumption patterns and the role played by the food environment. Various databases were searched like Medline, Scopus, PubMed, Ebscohost, Knimbus and Google Scholar to collect information for this review. A total of 255 papers were read and the relevant studies were included in the review.

TRANSITION IN FOOD CONSUMPTION PATTERNS

There have been changes in the food purchase and intake patterns owing to the increase in per capita income, changing lifestyles, women employment and other environmental factors. The per capita intake of processed foods and non-cereal based products is increasing rapidly in developing countries like India (Sharma, 2011). In developed countries like U.S, the total energy intake has risen over the past two decades across all age groups with a shift away from meals to snacks, from at home consumption to consumption away from home (Nielsen et al, 2002).Similar transitions are being observed all over the world. A study conducted in Spain concluded that from 1992 to 2003, an increased consumption of foods away from home and between meals was observed with a

remarkable decrease in the fruit and vegetable intake (Ribas-Barba et al, 2007). Urbanization leading to the increase in income, food availability and modernization of the food industry have brought about changes in the dietary choices (He et al, 2004).The use of supermarket has spread over across countries, cities to villages, from upper- and middle-class families to the working class.The percentage of income spent on processed foods has increased among urban consumers. The most significant factors influencing buying decisions were found to be quality, accessibility, regular supply, doorstep delivery and easy mode of payment (Morland et al, 2006).The same is occurring at different rates and stages in Asia, Eastern Europe, and Africa (Hu et al, 2004).WHO (2003) report indicated that the per capita per day energy intake has gone up by approximately 450-600 Kilocalories from 1960's to 2000. However, the energy supplied from cereals, animal and vegetable sources have declined over a period of time. Yet, an increase in the intake of fats is seen in different countries. Africa reportedly has the lowest at consumption while Europe and North America had the highest fat consumption. The highest increase in fat consumption per capita of 14 g was observed in developing countries, and lowest increase by (4 grams per capita) in developed countries and the countries experiencing a transition recorded a 9 grams decrease in fat intake per capita.In U.S. although the total intake of energy by the children has not changed, the macronutrient intake of the diet has changed. There is lesser consumption of total energy from fats but an increase in the consumption of foods providing carbohydrates and protein. Eating pattern changes may describe the reasons for increase in adiposity among children.For instance, increases have occurred in the number of meals eaten outside home, availability of food, increase in the portion sizes, snacking and meal-skipping (Schluter and Lee 1999).Consumption of snacks, soft drinks and high fat foods is also continuously increasing (Lytle et al, 2000 and Harnack et al, 1999).The National Health and Nutrition Examination Survey (NHANES) found that per capita calorie intake increased by more than 300 kilocalories among the US population from 1985 through 2002 (Kant and Graubard 2006).

TRANSITION IN LIFESTYLE

Accompanied with the changes in food intake, lifestyles of the people are also changing and undergoing transitions at a faster pace all over the world. Over the past two decades, there has been a sharp reduction in physical activity in all sections of the Indian population because of increase in mechanization in occupational, domestic and transportation spheres, both in rural and urban areas. Physical inactivity has been regarded as an important risk factor for various non-communicable diseases (NCDs). Sedentary lifestyles have been majorly attributed to cause cancers of around 21-25% of the breast and colon, approximately 27% of diabetes and 30% of heart disease (WHO, 2003). The report by WHO stated that globally around 3.2 million people die due to physical inactivity (WHO, 2010). Families with both parents working outside home, and time constraints have become crucial factors in determining the food purchase and consumption patterns. The food industry responded to these new family issues by increasing the numbers of convenience foods and prepared meals available**.** Unfortunately**,** the food industries too have been promoting foods that are high in fat and sugar and hence highly energy dense (French et al, 2001).

FOOD ENVIRONMENT AND ITS TYPES

Environment has a significant effect on the food intake, physical activity and lifestyle. The environment that we are surrounded with influences the food consumption pattern and eventually the health. People eat food which is available to them (Obaggy and Essery 2012). Many environmental factors promote unhealthy food choices that lead to the problem of obesity and associated non- communicable diseases (Oyeyemi et al, 2012). Familial patterns of obesity are well established. Genetic factors are also being held responsible for obesity but such dramatic increases in childhood obesity highlight the importance of environment and emphasize the need for research that can outline the environmental factors in causing childhood obesity (Hill and Peters 1998). There has been a tremendous change in the food environment (within and outside home) over the past few decades. Environmental influences affecting the consumption patterns include the changing nature of food production, supply, marketing, and food costs (Onge et al, 2003). The 'food environment' is understood in many different ways. Broadly, the food environment includes home, community and media/information environments (McKinnon et al, 2009; Glanz et al, 2005). Food environment has also been categorized into seven different types by the National Cancer Institute, U.S. (Figure 1).

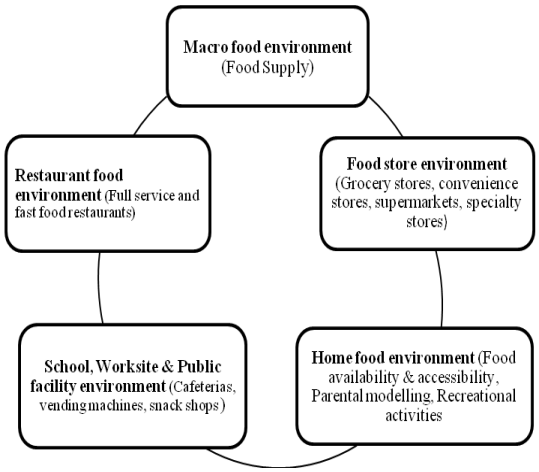

Figure 1: Types of food environments
Adapted from reference source- (NCI, 2006)

1. Macro Food Environment- the food environment at the macro level includes the food supply.
2. Food Store Environment- involves the various food stores i.e., grocery stores, supermarkets, convenience stores, specialty food stores etc.
3. Home Food Environment- includes the availability and accessibility of food within the home and is influenced by various factors like parental modeling and other activities in which the family members are involved.

4. Public Facility Food Environment- involves all the public areas catering to food like school cafeterias, office canteens, vending machines at public places.
5. Restaurant Food Environment- involves the restaurants of various types like full service dine in, fast food take away.

Of all the different types of environments, the *home* (where people have most of their meals with their family), the role played by the parents in shaping the food habits is crucial. The outside home environment mainly the food stores, restaurants and cafeterias also exert major influences on the diets and health of the people (NCI 2006).

EXTRA- FAMILIAL ENVIRONMENT (OUT OF HOME EATING)

Food environment plays a role in influencing dietary choices. It has been observed that money spent on foods eaten out of home has been on the rise for the past few decades. Extra- familial environment mainly comprises the food stores, restaurants (full service dine-in and fast food, take away), cafeterias in workplaces, colleges and schools. The food eaten out of home is generally energy dense and predisposes people to obesity and overweight. Many studies conducted in Europe and US have reported a positive association between out of home eating and overweight/obesity. And, of the total "out of home eating", mainly it is the fast food consumption that contributes towards the problem of obesity (Bezerra et al, 2012; Orfanos et al, 2007; Duffey et al, 2007; Jeffery et al, 2006; McCrory et al, 1999).Eating out and consumption of sugar-sweetened drinks and potato chips contributes to a higher calorie, fat and sugar intake and percent body fat (Gillis and Bar-Or 2003).Studies have found varied results on the association between food environments and obesity rates. Access to healthy food, supermarkets having variety of foods has been associated with lower incidence of obesity. But, studies have also found that presence of supermarkets in the vicinity of the households is not associated with the fruit and vegetable intake (Gustafson et al, 2013). However, increased fast food consumption, breakfast skipping has been positively correlated with increase in the body mass index among adolescents in studies conducted in India and U.S. (Kaushik et al, 2011 and Niemeier et al, 2006). The latter study has also shown that proximity of fast food joints to households could also predispose to increased consumption of fast foods (Niemeier et al, 2006). The 2010 Dietary Guidelines Advisory Committee, U.S Department of Agriculture (USDA) also concluded that there is consistent evidence which shows that children and adults who eat fast food more frequently are more prone to gaining weight and obesity. The documented association between fast food and obesity is strong for consumption of one or more fast food meals in a week (USDA 2010).A study on 140 Iranian adolescents found that individuals with the highest intake of fast foods had significantly lower NARs (Nutrient Adequacy Ratios) for Thiamin, Riboflavin, Phosphorus and Selenium (Rouhani et al, 2012). Another study on the frequency and characteristics of fast-food consumption and obesity prevalence among adults in Michigan, USA found that a high consumption of fast-foods was prevalent across education, income, and racial groups and was strongly associated with obesity. They recommended that making nutritional information at fast-food restaurants more readily available and easier to use may help consumers to order more healthful or lower-calorie items (Anderson et al, 2011).

Overweight and obesity were higher among the adolescents who liked to consume junk foods than those who did not in a study done in Hyderabad, India (Laxmaiah et al, 2007). Cross-sectional studies have also established gender differences between out of home eating and increase in Body mass Index (BMI). These differences are not so apparent in cohort studies (Bezerra and Sichieri 2009; Binkley et al, 2000). Another study on the association of the diets of German children with dietary quality and body weight status, pointed to the diminishing quality of diet with high consumption of Convenience Foods. A small but positive correlation between consumption of Energy Dense-Convenience Foods in boys and body weight has been found (Alexy et al, 2011).

INTRA- FAMILIAL (HOME) FOOD ENVIRONMENT

Family environment has been considered an important factor in the prevention and treatment of overweight and obesity (Ritchie et al, 2011; Young et al, 2007). Both physical (availability and accessibility of food) as well as social (like parent modelling and feeding practices, support for healthy eating) aspects of the home environment influence the dietary intake and health of the family members (Tabak et al, 2012). Frequency of family meals, availability of food at home and modelling by the parents are few key aspects that could help in identification of healthy food consumption patterns (*Figure 2*). A decrease in the intake of total energy and fat has been linked with a higher score on the family food habits index which indicates frequent family meals, parental modelling for intake of fruits and vegetables, and preparation of low fat foods (Tibbs et al, 2001). The home and family environment is an important place for modelling both adults' and child's eating.Review of literature from different countries suggests that characteristics of the family eating environment such as shared family meals, viewing television during meals, parental modelling of dietary behaviours, family interaction, self-efficacy, parental feeding styles, availability of food and accessibility to the family food environment possibly affect food habits (Brown et al, 2008). An Irish study examined factors which included intra-individual factors: the link between food preferences and awareness of healthy eating; intra-familial factors: the role of the home food environment; and extra-familial factors: eating away from the home. Findings indicated that there were developmental differences between children's and adolescents' perceptions of factors influencing food choice. Among adolescents, the control by the parents on their children began to diminish and adolescents exercised increased autonomy over making their choices for food as compared to younger children (Fitzgerald et al,2010).

A study was conducted on the family food environment and dietary behaviors which were likely to promote fatness

in 5-6 year old children in Australia. The results showed that several aspects of the family food environment were associated with the dietary outcomes likely to promote obesity in children. Increased T.V viewing time was associated with increase in energy intake, increased sweet snack consumption, high energy drink consumption and decreased vegetable intake. In addition to this, parent's increased confidence in the adequacy of their children's diet was associated with increased consumption of snacks and decreased vegetable intake (Campbell et al, 2006). Another study on 157 families from South Australia with children aged 5-10 years concluded that there is a complexity of relationship between family environment, health behavior and obesity. Parents' BMI, nutrition and physical activity knowledge had a strongest direct association with children's BMI Z scores. Physical activity and food environment was found to be associated with children's sedentary and activity habits and fruit and vegetable intake. Those with a sedentary lifestyle had a lower intake of fruits and vegetable (Hendrie et al, 2011).

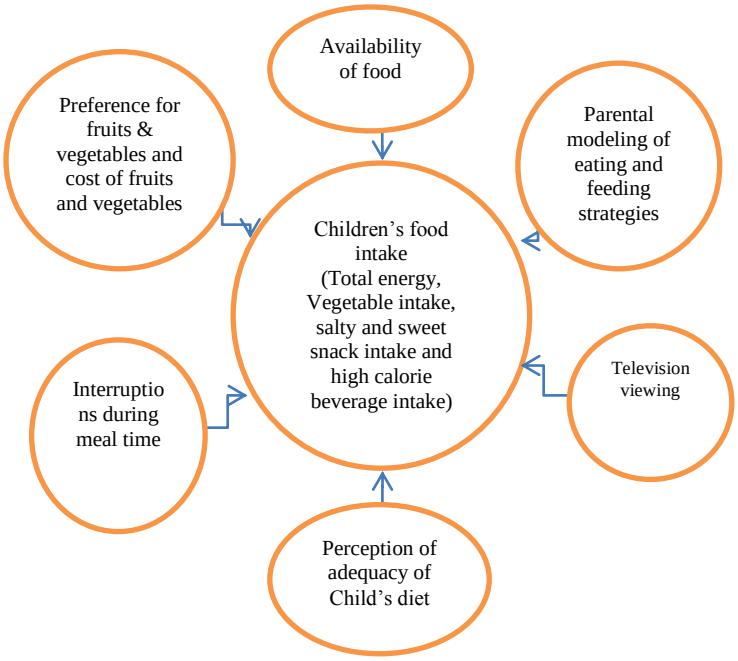

Figure 2: Predictors of Children's Food Intake in the Family environment

PARENT'S ROLE (MODELING AND FEEDING STRATEGIES)

Parents play an important role in shaping the food habits and health of their children. Many of the studies have shown that making modifications in the parent's feeding practices have brought about changes in the food preferences of their children towards more of vegetables than sweet foods (Haire-Joshu et al, 2008; Gibson et al, 1998). So, considering parents as key mediators for changing children's diet may be an effective way of influencing child's health behavior (Golan and Crow 2004; Golan et al, 2006). Mothers are the main care providers for their children and the quality of care provided by them is largely dependent on their knowledge of nutrition and health practices. Studies have found significant association between maternal nutrition knowledge and child's nutritional status. Establishing healthy eating habits in young children may have long term benefits for diet and health (Ruel et al, 1992; Appoh and Krekling 2005). One way of influencing children's eating behavior is through the feeding strategies employed by the parents (Moore et al, 2007). Parent's interest in their children's eating habits may make them particularly receptive to learning about and facilitating healthy choices in behaviorally appropriate ways (Tucker et al, 2006).Research suggests that different feeding strategies may have different outcomes. For instance, repeated taste exposure to novel foods has been shown to be an effective means of increasing both likings and subsequently the consumption (Wardle et al, 2003). Likewise, modeling food consumption via adult, peer and sibling models has also shown to be an effective means of encouraging healthy food consumption (Hendy and Raudenbush 2000). On the contrary, other strategies like restricting a child's access to a particular food may have undesirable outcomes as it has shown to increase the consumption and liking for that food. It has been associated with increased eating and weight status (Janssen et al, 2005).

TELEVISION VIEWING

Studies have examined associations between hours of T.V viewing, exposure to other multimedia (like use of computers and video games) and sedentary behaviors leading to overweight (Burke et al, 2006; Kautiainen et al, 2005; Laurson et al, 2008). A positive association has been documented between overweight and TV viewing, but the association between computer use and video games with overweight is less consistent (Janssen et al, 2005; Must and Tybor 2005 and Rey et al, 2008).

FAMILY MEALS

The frequency of family meals has been found to be positively associated with desirable behavior such as reduced screen time, support for healthy eating from the parents, availability of fruits, vegetables and healthy foods at home, consumption of more of fruits and vegetables and eating breakfast regularly. All these aspects in turn have been related to lower BMI. It is evident that positive family environment has positive influences on the diet and health of the individuals. Studies have examined the relation between frequency of family meals and overweight/obesity (Utter et al, 2008; Sen 1997). A study showed no association between dietary patterns and Coronary Heart Disease (CHD) risk, but suggested that BMI modifies the relation between diet and CHD risk (Osler et al, 2002). It is also seen that overweight youth are 2.4 times likely to have a high serum total cholesterol level, and 43.5 times higher cardiovascular risk. Successful prevention and treatment of obesity in childhood could reduce the adult incidence of cardiovascular disease. Prevention of obesity by promoting healthier lifestyles should be one of our highest priorities (Shepherd et al, 2006).

CHANGING FOOD PATTERNS, LIFESTYLE AND ENVIRONMENTINFLUENCING HEALTH

The changing food consumption, lifestyle and food environment are found to be responsible for many

chronic degenerative diseases and other health problems. The over- consumption of nutrients and food components like fats, saturated fats, sugar and salt are related to an increased risk of these diseases. Studies have consistently shown that unhealthy diet and physical inactivity are related to the development of chronic degenerative diseases like coronary heart disease, diabetes, stroke, hypertension and various forms of cancer throughout the different life stages and not only in adults (WHO, 2002). Food consumption patterns that are characterized by high intake of whole grains, fruit and vegetables, fish, low fat foods have been associated with lower risk of heart disease (Hu *et al,* 2000; Kerver et al, 2003; Liu *et al,* 1999) and cancer (Slattery *et.al,* 1998). Whereas, high consumption of high glycemic index carbohydrates have been linked with higher rates of diabetes (Hu et al, 2000; Salmeron *et al,* 1997), obesity and heart disease (Leeds 2002). High salt intake has been related to cardiovascular diseases, high blood pressure in a systemic review (Strazzullo et al, 2009). High intake of trans fats has been linked to various cardiovascular risk factors.Most of the dishes eaten away from home have hidden fat, which is a health concern as many edible fats are hydrogenated, increasing the consumption of trans fats (WHO 2002). Trans fat increases the risk of degenerative diseases. On the other hand, sugar intake has also increased in most of the developing countries giving rise to increased incidence of Type 2 diabetes. Thus, food intake patterns have relevance to the disease risk and focusing on the food group consumption is one area in nutrition research which is to be targeted for developing public health policies (Mozaffarian et al, 2009).WHO (2010) reported that NCDs can be prevented and controlled to major extent by reducing the major risk factors i.e., unhealthy diets, physical inactivity, tobacco and alcohol use.

FEW OF THE RECOMMENDATIONS ARE

- The food service establishments/food industry must be encouraged to provide smaller portions of high calorie foods and at the same time include in their menus healthy food options, low in calories, fat, added sugar and sodium to minimize disease risk. Providing nutrition information on the menu of the foods consumed out of home may also prove beneficial.
- Governments should develop policies to promote food stores selling healthy foods like tax rebates, at the same time levying higher taxes on unhealthy foods served at fast food chains and other restaurants.
- Unhealthy food should be banned from workplaces, schools and colleges.
- Unhealthy food ingredients to be replaced by healthier ones. Food industries to be encouraged to alter their cooking practices and cooking medium like in some food establishments frying has been replaced by baking to reduce the fat content in the food item. Similarly, the type of fat being used should be replaced with healthier options available.The sugar content in sugar sweetened beverages should also be lowered. More research is needed in the development of healthier and tastier foods.
- There needs to be a policy against marketing of unhealthy foods. 'Nutrient Profiling' system suitable for Asian countries which could help the consumers in making healthy food choices should be made mandatory.
- Compulsory nutritional labeling on all packaged food commodities. Food ingredient amounts especially of salt and sugar along with nutrients that are to limit in the diets- Fats, saturated fats, trans fats to be clearly mentioned on the label. Many packaged foods still do not have all necessary nutritional information on the labels.
- At the home level, people should be motivated for consumption of healthy foods through effective communication strategies. All family members eating together also exert a positive influence on the types of food being consumed by the family. Family members should be encouraged to read the food labels, encourage each other to eat healthy and follow a healthy lifestyle by being physically more active.
- A strict ban should be imposed on the T.V advertisements encouraging the purchase and consumption of unhealthy foods. U.K and U.S are already practicing this strategy but in many Asian countries there is no ban. Still the advertisements lure the people especially children by different schemes to promote their unhealthy food products.

CONCLUSION

From the literature available on the food consumption patterns and the possible effects of the food environment on the consumption patterns, it was found that food environment (both Extra -familial and Intra-familial) does have a role to play in shaping the intake patterns. The availability and access of unhealthy food at home or outside the home makes people inclined towards eating those foods with consequent adverse effects on their health and weight status. Policy action is needed at the National level to put in place strategies for improving the dietary practices and health of the individuals. The interventions and policies should be such that they have a positive impact on the overall food environment which subsequently will affect the food consumption patterns and health of the people.

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