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Influence of Stage of Change, Self-Efficacy and Socio-Economic Factor on Dietary Fat Intake Behavior among Saudi Women

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Abstract: Diet high in fat contributes significantly to development of major chronic diseases. The purpose of this study was to examine the influence of stage of change, self-efficacy and socio-economic factors on dietary fat intake behavior among university employee's women in Saudi Arabia. A total 74 non-academic staff aged 23-52 years in of King Faisal University participated in the study. A pre-tested interview questionnaire was used to measure socio-economic, stages of change and self-efficacy related to dietary fat intake, also anthropometric measurement, total energy and dietary fat intake were determined. Chi square test, one way analysis of variance and multiple regression analysis were used for data analysis. Results showed that about 20% of subjects reduce their daily fat intake and more than two-third of subjects (67.5%) intend to change. There were significant differences between stages of change for dietary fat and energy from fat ($F = 6.57-7.64$, respectively; $p = 0.00$) and significant association between stages of change and age ($p = 0.014$). The anthropometric measurement did not differ significantly by stages. Stages of change ($p = 0.00$) and self-efficacy ($p = 0.044$) were the most relevant predictor for dietary fat intake. This study revealed important relationship between stage of change, self-efficacy and dietary fat intake, which is useful insight for health professionals and nutrition educators to explore other target groups in the community and to design effective intervention.

Key words: Stages of change, self-efficacy, dietary fat, socio-economic, employed women

INTRODUCTION

Diet high in fat affects and defines health of people. It is contributes significantly to development of major non-communicable diseases (WHO, 2003). Many studies conducted in Saudi Arabia showed a high prevalence of diabetes mellitus (AL-Nozha *et al.*, 2004a), cardiovascular diseases (AL-Nozha *et al.*, 2004b), hypertension (AL-Nozha *et al.*, 2007) and obesity (Al-Othaimen *et al.*, 2007) specially among women, which is resulting of nutrition transition characterized by an abandonment of traditional diets that are high in fiber, grains, fruits and vegetables and increasing modern diets that are high in fat, sugar and salt (Popkin, 2006). The national food balance sheet showed that per capita energy intake rose from 1801 kcal in 1971-3015 kcal in 2004 and fat intake increased per capita from 34-76.1 g/day in the same period (Saudi Food Balance Sheet, 2004).

Saudi Arabia as a developing country transition in lifestyle, increased contributions of women in social life and socioeconomically requirements lead to an increment in the number of employed women where 33.23% of the government employed was women and this number will be increase in the next few years (Ministry of Civil Services, 2008). Traditionally, women have been responsible for the health and well-being of their family members, such as planning and preparing meals (Selvan *et al.*, 2004) even though many women

are now employed, these traditional roles continue to challenge many working women. Researchers in the disciplines of psychology, social work, sociology and women's studies have examined the working woman's roles within her family and the impact of a woman's employment on the health of members of her family and her own personal health. They have shown that dietary habits and lifestyle among married women can affect their husbands and families (Selvan *et al.*, 2004).

Dietary behaviors, such as consuming a diet lower in fat remains a challenge and complex as the behaviors are influenced by many factor such as personal beliefs and experiences, socio demographic factors and cultural (Shepherd, 2005). Using theories and models helps researchers to understand the dietary behavior of people. One of the more popular models for interpreting dietary behaviors is the Transtheroetical Model (TTM) or stages of change. This model based in health psychology explains or predicts a person's success or failure in achieving a proposed behavior change, such as developing different habits and was developed by Prochaska, DiClemente in the 1983. The TTM proposes five stages of change: Pre-contemplation which is no intention to change behavior and usually measured as the next 6 months, Contemplation considering changing behavior usually within the next 6 months, Preparation is the stage in which a person intending to change behavior within the next month, Action stage is adopting

a new behavior for fewer than six months and Maintenance which working to prevent relapse and consolidate gains changed in behavior for more than six months (Redding *et al.*, 2000). The TTM has been found to be applicable to wide range of dietary behaviors, including fat reduction and increased fruit, vegetable and fiber intake. Several studies has been applied the model to understanding the nutritional behavior (dietary fat reduction) and identifying characteristics of individuals such as McDonnell *et al.* (1998) conducted across-sectional survey among university employees they found more women were in maintenance stage compared with men, Wong *et al.* (2009) reported university employees women tended to be in preparation stage (71%), whereas men had less percentage. Hargreaves *et al.* (1999) found older women (<45 years) with higher level of education more likely to be in the action and maintenance stages.

Self-efficacy introduced by Bandura as a core component of the Social Cognitive Theory of human behavior (Bowen *et al.*, 2004), it is defined as one's confidence in performing or ability to successfully carry out a particular behavior and has been incorporated into the TTM model for the affects of progressive movement from stage to stage of behaviors change or a temptation to continue these behavior (Leer *et al.*, 2008) also it has been shown to be associated with dietary fat reduction behaviors in women (Plotnikoff *et al.*, 2009).

More is known about predictors of lifestyle health behaviors as consuming a low fat diet for example, socio-economic factors such as higher education, be female and older age (Curry *et al.*, 1992), stage of change (Glanz *et al.*, 1994) and self-efficacy (Plotnikoff *et al.*, 2009), around the world but to date no studies have documented the relationships among socio-economic, stage of change, self-efficacy and fat reduction in employed women in Saudi Arabia, this study was conducted to examine the influence of socio-economic, stage of change and self-efficacy on dietary fat intake behavior among university employee's women in Saudi Arabia.

MATERIALS AND METHODS

Subject and study design: A cross-sectional study of 74 voluntary female aged 23-56 years was carried in King Faisal University (KFU) in AL-Hssa in the Eastern Province of Saudi Arabia. A list of Saudi non-academic staff in female section at the university was obtained from Deanship of Staff Affair, where all the female (92 subjects) invited to participate with informed consent and an information sheet about the study. We excluded subjects with any chronic disease or pregnant before starting this study.

Measure: A pretested interview questionnaire was used to collect the following data:

Socio-economic characteristics: Six questions assessed the age, level of education, marital status, income, duration of working at KFU and health status.

Stage of change: Stages of change for fat reduction was assessed by five questions used in previous study (McDonnell *et al.*, 1998) were translated to Arabic and pretested for clarity of meaning. Each subject asked to indicate which of five statement best represented her (Table 1). All the five statements were first read aloud then the interviewer read through the statements again asking each subject to stop the interviewer when they reached the statement that best represented her. To prevent small numbers for analyses the five stages were collapsed into three stages as shown in Table 5. Previous studies such as Campbell *et al.* (1999) and Verheijden *et al.* (2004) collapsed action and maintenance into one group because the small number of subjects in the action and maintenance stages. In this study the tow stages were similarly collapsed, also subjects in action and maintenance stages have changed their fat intake. In addition the contemplation and Preparation stages were combined which is similar to Tucker *et al.* (2002) and Greene *et al.* (1999), we use the relation that both stages are intend to change but they differ in time (within six months or next month). Pre-contemplation was left by itself because subjects in this stage have not made any changes or have any intention to change.

Dietary intake: The dietary intake was assessed using one-day 24 h recall. The household measures (teaspoon, table spoon, glass, soup cup and plate) were used to help subjects to estimate the portion intakes, which were then converted to metric measurements (g). We asked subjects to recall the usual dietary habits without alteration or modification. All 24 h recalls were checked by the researchers to improve the accuracy and complete any missing data before any analysis was done. The Nutritional Health Balance Program software was used to analyze the dietary intake for total energy and fat intake as well as percentage of fat calories. Basal Metabolic Rate (BMR) was calculated based on the established formula by Henry and Rees (1991) to estimate the basal metabolic rate (EI: BMR) ratio.

Anthropometric measurement: Body weight was measured in light clothing, without shoes to the nearest 0.1 kg using digital weighting scale (TANITA). The balance was placed on hard flat surface and checked for zero reading before each measurement. Subjects were asked to stand unassisted in centre of platform and looking straight ahead during the measurement. Height was measured to nearest 0.1 cm using a GIMA tape.

Table 1: The five statement for stages of change

Stage of change	Description
Pre-contemplation	I have not made major change to the amount of fat in my diet in the past two years and I do not intend to make any changes in the next 6 months.
Contemplation	I have not made major change to the amount of fat in my diet but I do intend to do so within the next 6 months
Preparation	I have tried to reduce the fat in my diet in the last 6 months and I intend to try again in the next month.
Action	I am actively trying to reduce the amount of fat in my diet and I have made changes to what I eat in the last 6 months.
Maintenance	I eat low fat diet and have been doing this for at least 6 months.

Table 2: The mean responses to self-efficacy statements

Self-efficacy statements	Mean score
Choose and buy low-fat food such as skinless chicken, low fat milk and yogurt.	3.35±1.56
Prepare each meal such as breakfast, lunch and dinner with the minimum amount of oil and fat.	4.18±1.23
At restaurant I am not choose the fried food with high contents of oil such as fried chicken.	2.52±1.73
Change the ingredients of my favourite foods to reduce the amount of fat.	2.42±1.52

Body Mass Index (BMI) was calculated as weight (kg)/height² (m²) and classified according to World Health Organization (WHO, 1998). Waist circumference was measured with a flexible tape. The waist circumference was measured between the costal margin and iliac crest, ≥ 80 cm was considered as high risk for abdominal obesity for women (WHO, 1998).

Self-efficacy: Self-efficacy of dietary fat reduction was measured via a series of four statements in which subjects asked to rate their confidence in their ability to consistently avoid eating high fat foods. These statements included choosing or buying low fat food, preparing meals with little oil, selecting foods at restaurants that are not fried and altering there favourite recipe to reduce fat (Table 2). Responses options on a five-point Likert scale ranged from one (I know I can not) to five (I know I can).

Face validity of the items was done to evaluate clarity and readability of the individual item and of the overall items by nine non-academic staff that fuelled the research selection criteria, to ensure content validity of the items a review was carried out by the expert panel comprising three nutritionists. Cronbach's alpha was used to determine internal consistency (reliability) of the items. The reliability of the items $\alpha = 0.79$ which was deemed acceptable.

Statistical analysis: The collected data was analyzed using the Statistical Package for Social Sciences SPSS program version 18. The exploratory data analysis was carried out to determine the normality of data; descriptive statistical analysis was used to determine the results as mean, standard deviation frequency and percentage. Chi square was used for association between socio-economic factors and stages of change. For a 2 x 2 table which contains cells that have expected count less than five, Fisher's exact test was used to determine the association. One-way analysis of variance also used to assess the differences in stages of dietary changes

regarded to dietary fat intake, anthropometric measurement and self efficacy. The multiple regression was conducted to determine the relationship between socio-economic, stages of change, self-efficacy and dietary fat intake in employed women in Saudi Arabia. A difference of $p < 0.05$ was accepted as significant.

RESULTS

The study sample consisted of 74 women between the ages 23-52 years; most of them well educated were 64.9% had university level. The majority of subjects (65.6%) married with higher household income (>10000 SR). The mean years of working at KFU was nine years, by using a single item to indicate the health status tow third of subjects rated their health as good (Table 3).

The mean intake of energy was 1,028 kcal per day which is below the recommendation (2319 kcal/day) (-), the mean fat intake was 39.7 g/day with average intake of energy from fat 34.4%/day while more than two-third of subjects consumed more than 30% of total calories from fat. On the other hand, the mean Energy Intake Basal Metabolic Rate (EI: BMR) ratio of subjects was above the acceptable limit of more than 1.35, indicating that the energy intake was not under reporting as a group. While only 28.4% of subjects in under-reporting category and 71.6% in normal-reporting category.

Table 4 presents the distribution of subjects in each category for the anthropometric measurement, BMI classification showed that almost half (48.6%) of subjects obese and 67.6% of them had waist circumference more than 80 cm.

The distribution of subjects by stages of change for dietary fat reduction indicated that 35.1% were thinking about or had recently decided to change to low fat diet, similarly 32.4% of subjects in contemplation stage. Relatively low proportion (12.2%) of subjects had either recently implemented change within six months while only 8.1% of subjects had dietary fat reduction more than six months.

Table 3: The socio-economic characteristics of respondents and perceived health status (N = 74)

Characteristics	n (%)	Mean±SD	Min-Max
Age		34.75±7.26	23-52
<35 years	43 (58.1)		
≥35 years	31 (41.9)		
Years of educational		13.27±4.32	5-20
Educational level			
Primary + Secondary school	4 (5.4)		
High school	22 (29.7)		
University	48 (64.9)		
Marital status			
Single	16 (24.3)		
Married	50 (67.6)		
Widow	6 (8.1)		
Monthly personal income (RS)		6320.54±738.32	2500-15000
<3000	8 (10.8)		
3000-5999	20 (27.0)		
6000-10000	22 (29.7)		
>10000	24 (32.4)		
Duration of working		9.55±7.7	3-30
Perceived health status			
Excellent	20 (27.0)		
Good	45 (60.8)		
Fair	9 (12.2)		

Table 4: Nutritional status, anthropometric measurements and stage of change (N = 74)

Variables	n (%)	Mean±SD	Min-Max
Nutritional status			
Energy intake (kcal)		1028.46±430.05	787.69-2073.12
Fat intake (g)		39.71±33.46	10.73-92.24
Percentages of calories from fat (%)		34.47±12.9	12.39-97.47
Level of fat (%)			
<20	8 (10.8)		
20-30	19 (25.7)		
>30	47 (63.5)		
Anthropometric measurements			
Weight (kg)		76.88±15.82	45.90-142.6
Body mass index (BMI) (kg/m ²)		30.48±6.25	20.00-60.1
Normal 18.5-24.9	16 (21.6)		
Overweight, 25.0 - 29.9	22 (29.7)		
Obese>30.0	36 (48.6)		
Waist circumferences(cm) WC		88.51±12.53	58.00-134
Normal<80 (cm)	24 (32.4)		
At risk ≥80 (cm)	50 (67.6)		
Stage of change			
Pre-contemplation	9 (12.2)		
Contemplation	24 (32.4)		
Preparation	26 (35.1)		
Action	9 (12.2)		
Maintenance	6 (8.1)		
Self-efficacy		12.47±4.0	4.00-20
Level of self-efficacy			
Good (14-20)	31 (41.9)		
Moderate (8-13)	35 (47.3)		
Low (1-2)	8 (10.8)		

Dietary self-efficacy showed the highest mean scores for statement prepare meals with the minimum amount of fat where subjects had more confident but for not choosing fried food at restaurant and altering there favourite recipe to reduce fat were subjects not very confident with mean score two for the both statements. Choosing or buying low fat food subjects had mean

score three (Table 2). The distribution of the subjects in the levels of self-efficacy showed that the almost similar percentage (>40%) for good, moderate and only 10% of subjects had low confidence (Table 4).

A higher percentage (56%) of younger women (<35 years) were more likely to be in the preparation and contemplation, whereas older women were more likely

Table 5: The socio-economic characteristics of respondents by stages of change of dietary fat reduction (N = 74)

Stages of change	Maintenance + Action (n = 15)	Preparation + Contemplation (n = 50)	Pre-contemplation (n = 9)	χ^2
Age	36.46±7.96	35.42±7.53	33.45±6.69	
<35 years	6 (14.0)	28 (56)	9 (100.0)	0.014*
≥35 years	9 (29.0)	22 (44)	-	
Educational level				
<University	7 (26.9)	18 (36)	1 (11.1)	3.18
≥University	8 (16.7)	32 (64)	8 (88.9)	
Marital status				
Unmarried	5 (16.7)	16 (32)	4 (44.4)	0.29
Married	10 (22.0)	34 (68)	5 (55.6)	
Monthly personal income (RS)				
<6000	6 (21.4)	20 (40)	2 (22.2)	0.055
≥6000	9 (19.6)	30 (60)	7 (77.8)	

*p<0.05

Table 6: Nutritional status, anthropometric measurements and self-efficacy by stage of changes of dietary fat reduction (N = 74)

Stages of change	Maintenance + Action (n = 15)	Preparation + Contemplation (n = 50)	Pre-contemplation (n = 9)	F-value
Nutritional status				
Energy intake (kcal)	975.84±84.74	1071.1±459.7	1087.32±312.95	1.65
Fat intake (g)	20.27±7.12	42.6±22.12	56.72±15.87	6.57**
Percentages of calories from fat (%)	19.33±4.5	34.8±5.61	55.7±21.97	7.64**
Anthropometric measurements				
Weight (kg)	71.29±11.42	78.34±16.7	77.62±16.39	0.31
Body Mass Index (BMI) (kg/m ²)	28.91±4.98	31.1±6.61	29.65±6.08	0.41
Waist circumferences (cm) WC	86.13±8.74	89.85±13.34	85.05±13.23	0.45
Self-efficacy	14.33±3.43	12.56±3.83	10.55±5.81	4.49*

*p<0.05; **p<0.001

Table 7: The multiple regression model for the most relevant predictors for dietary fat intake

Variables	Co-efficient	Standard error	t-value	p-value
Socio-economic factors				
Age	-0.034	0.171	-0.349	0.728
Educational	0.045	1.993	0.603	0.549
Marital status	-0.102	1.992	-1.401	0.166
Anthropometric measurements				
Weight	0.328	0.168	1.592	0.116
Body mass index	-0.121	0.461	-0.541	0.59
Waist circumferences	-0.101	0.192	-0.542	0.59
Stage of changes	0.736	1.683	9.938	0.00**
Self-efficacy	0.530	0.930	3.816	0.044*

*p<0.05; **p<0.001

to be in action and maintenance stages (29%). Subjects with higher levels of education and married (64%, 68% respectively) tended to be in the preparation and contemplation, almost similar proportion of subjects distributed across the low levels of income in maintenance and action stage. Significant association was noted between stages of change and age (Table 5). Table 6 presented the one way analysis of variance which indicated significant differences for fat intake (F = 6.57; p<0.05) and percentage of calories from fat (F = 7.64; p<0.05) through the stages. Energy intake decreased across stages of change where subjects in action and maintenance stages have lowest intake (975.84 kcal). The anthropometric measurement did not differ significantly by stages of change. Self-efficacy was found significantly increased across stages of change

where subjects in action and maintenance stages have highly confident to reduce their dietary fat intake (F = 4.49; p<0.05).

The multiple regression analysis was conducted to determine the best predictor for dietary fat intake (Table 7). The model included the socio-economic factors, self-efficacy, stage of changes and anthropometric measurements. Stages of change (p = 0.00) and self-efficacy (p = 0.044) were the most relevant predictor for dietary fat intake and the adjusted R² = 0.672.

DISCUSSION

An important feature of this study, it is the first application to our knowledge of the TTM model or stages of change and self-efficacy to study dietary fat intake among university employee's women in Saudi Arabia. The

current study was conducted among voluntary women who possess higher monthly income (>10,000 SR) and a better education (with a bachelor degree) and married. The subjects were predominantly in contemplation and preparation stage with only 12% of subjects in action stage and 7% in maintenance stage. This differs from stage distribution found in other studies (Curry *et al.*, 1992; Campbell *et al.*, 1999; Glanz *et al.*, 1994; McDonell *et al.*, 1998; Ounpuu *et al.*, 2000) reported low proportion of subject in contemplation and preparation stage and the majority of subjects in action and maintenance stage. However, this study include younger adult (58% <35 years) and the studies above majority of the subjects older than 40 years while be older adult and women appear to consume low fat and they aware about their health than younger adult (Lopez-Azpiazu *et al.*, 2000; Nothwehr *et al.*, 2006), also this studies conducted in developed countries which people maybe had awareness about the risk factor of diet high in fat and chronic diseases more than developing countries. However, the difference in these result could be due to different algorithms may have contributed to differences in distribution across stage of dietary change compared to other studies.

On other hand we found significant association between stages of changes and age which is similar to Curry *et al.* (1992) they reported association between age, education, health status and stages of change while Hargreaves *et al.* (1999) they found significant association between age, education and stage of changes, where women older age and will educated tended to be in action and maintenance stage and younger women were more likely to be in pre-contemplation, contemplation and preparation stage. No significant association was found for other socio-economic factors.

We found significant difference between dietary fat intake, percentage of fat energy and stage of changes, were fat consumption and fat percentage significantly decreased through the stages where subjects in action and maintenance stage had lowest intake. As this study found, several studies (Curry *et al.*, 1992; Glanz *et al.*, 1994; Green *et al.*, 1999; Hargreaves *et al.*, 1999; Ounpuu *et al.*, 2000) found similar result with fat intake and percentage of fat energy. These studied also found that the amount of fat in subjects diet decreased as the stage of changes progressed.

Our result showed no significant difference across the stages for anthropometric measurement but we observed subjects in contemplation and preparation stage were obese and had higher waist circumferences comparison to the other stages. However, all the groups in the stages had means for BMI and WC above the accepted cutoff point, Nothwehr *et al.* (2006) reported similar to our result where subjects in contemplation and preparation stage had higher mean of BMI (31, 30

respectively) than other stages, also Glanz *et al.* (1994) and McDonell *et al.* (1998) reported that subjects who were classified as overweight or obese more likely to be in contemplation and preparation stage and attempting to change their dietary habits especially to fat consumption to reduce weight but these studies reported significant difference across stages. Generally, our result showed the prevalence of obesity in this study more than the data of the National Nutrition Survey while women in Saudi Arabia had 28.4% prevalence of obesity and in the Eastern Province the prevalence was 27.7% (Al-Othaimeen *et al.*, 2007). Overall, two-third of subjects had WC \geq 80 cm which is putting these women at risk for many chronic diseases related to abdominal obesity (WHO, 2003).

This study also assessed self-efficacy with regard to dietary fat intake. The mean of self-efficacy was significantly difference across the stage, indicating that self-efficacy may influence fat intake behavior while those with higher mean of self-efficacy more confidence in ability to change, were less likely to thinking about change and more likely to be in action and maintenance stage. These results corroborate other studies that have shown higher mean of self-efficacy are associated with advanced stages of changes (Curry *et al.*, 1992; Glanz *et al.*, 1994; Green *et al.*, 1999; Ounpuu *et al.*, 2000; Plotnikoff *et al.*, 2009).

However we found stage of changes a highly significantly ($p < 0.001$) predictor of fat intake as findings of Curry *et al.* (1992) and Glanz *et al.* (1994) showed stages of changes are a unique predictor of dietary fat intake American adults, also we found self-efficacy predictor of fat intake ($p < 0.05$) while several studies found similar result to our findings, Liou (2004) and Liou and Contento (2001) reported that self-efficacy as an important predictor of dietary fat intake in Chinese American, Plotnikoff *et al.* (2009) reported similar result among Canadian adults. This result demonstrates that stage of changes and self-efficacy were an important predictor of dietary fat intake.

A number of limitations should be considered when interpreting our findings. Generalization of the study findings to other target groups and locations may be limited because the study was done only in Eastern Province of Saudi Arabia and among university employees. In the present study subjects were an educated subjects and volunteers who limit the generalization of our findings to less educated women and lower socio-economic status. In our study we used a single 24-h dietary recall to obtain dietary data and this type of measurement (one-day) limits the information about usual dietary intake. Despite this method's validity for assessing intakes of energy and fat has been documented (Conway *et al.*, 2004). However, it could not be used to reflect the diet of the Saudi women in general. The distribution of subjects across the stages

was similar to other studies (Tucker *et al.*, 2002; Verheijden *et al.*, 2004) but estimates for stages with smaller numbers of subjects may not be very accurate. Differences in stage distribution may also be explained by differences in levels of motivation to reduce dietary fat intake. Finally this study include the cross-sectional design, which precludes conclusions about causal relationships, also a random sample of individuals was not attempted in the selection process where all the Saudi female and non-academic staff in the female section in KFU were invited to participate and we excluded subjects not meet our criteria (18 subjects).

Conclusion: Our results have provided preliminary findings on the application of TTM model or stage of change and self-efficacy among Saudi women, it is revealed important relationship between stage of change, self-efficacy and dietary fat intake. This finding may provide useful insight for health professionals and nutrition educators to explore other target groups in the community and to design effective intervention, further research should focus on learning people how they can set goals to move from stage to stage and reduce barriers to change.

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