Lifestyle and Nutrition and their Impact on Health of Saudi School Students Living Abroad in Newcastle, UK

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Abstract: Moving to live in new location, new food habit should be adapted, children and adolescence develop healthy behaviours and attitudes particularly from age 6 to 17, so this study investigates the effect of lifestyle and nutrition and the impact on health among Saudi school students living in Newcastle, UK. Inclusion criteria included both male and female students who attend Saudi school in Newcastle upon Tyne. A designed questionnaire was used to collect data regarding lifestyle practices and dietary habits. Weight, height, and body mass index were obtained. Breakfast was a daily meal for 92% of primary school students compared to 77% of secondary school students. Milk was consumed daily by 43% of the sample. Diets were rich in carbohydrates; fast food consumption was high (2.2 ±1.2 times/week). Physical exercise was practiced significantly between grades. Sleeping hours during school days were adequate (8.3 ±2.1 hours/day), but lower (8.2 ±1.7 hours/day) during vacation. Underweight with 44% and overweight with 8% were prevalent. There were significant differences between males and females in height, weight and BMI ($P < 0.05$). In conclusion, these findings support our argument that the dietary changes observed among the Saudi students living in Newcastle were the result, at least in part, of rapid dietary acculturation related to their temporary translocation. It is important to help Saudi students and their families retain healthful food habits from their original country and to encourage them to choose eating patterns of the new culture that are nutritionally sound.
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1. Introduction:

It has become visible that developing healthy lifestyle habits is more crucial beginning at childhood and adolescence, since diet and physical activity have shown vital roles in maintaining health and preventing diseases (Spear,2002). Tobacco use, physical inactivity, improper diet and other unhealthy lifestyles are leading causes of preventable chronic diseases worldwide (Boutayeb and Boutayeb, 2005). As stated in Ministry of Higher Education for Planning and Information, (2011) report, during the academic year 2010/2011, the number of Saudi students enrolled in UK institutions of higher education was 16,067. Saudis moving to the UK will encounter a new, totally different culture from their own culture, effecting their overall lifestyle. Food habits and lifestyle changes will influence Saudi students at their first arrival to the UK. As a result, they will face difficulty maintaining their usual habits of eating because of their traditional foods are unavailable or they do have sufficient cooking and food preparation skills (Papadaki and Scott, 2002).

Lifestyle changes, particularly dietary habits, amongst Saudis who study abroad are usually associated to acclimatizing to the new community they have moved to. A few studies have shown that dietary habits are expected to change to a more westernised diet (Gilbert and Khokhar, 2008). Changes in eating habits and the availability of certain food items may affect one's health when moving abroad, as this will lead to modifications in their dietary intake. A change from conventional Saudi foods to a more westernised diet could be undesirable because westernised foods normally contain higher amounts of salt, saturated fat, calories, and sugar. Also, the rising popularity of fast foods and ready-made meals has become an easier, more available and cheaper alternative (Al Farhan, 2011). Traditional foods may be unavailable or limited when moving abroad causing a struggle for international students to follow their eating habits. In addition, there are other factors that will give rise to difficulty for these students including, cultural differences, a language barrier, lack of communication, and a lack of knowledge about the new environment around them (Al Farhan, 2011). The purpose of this study was to emphasize on the effect of health of boys and girls, in various levels of education in schools, as the lifestyle and dietary patterns change; as well as to stress on the consequences of dietary pattern on nutritional problems among them.

2. Methods:

A cross-sectional study was conducted from January–May 2016 to investigate the effect of lifestyle and nutrition and the impact on health among Saudi school students living in Newcastle, UK. Inclusion criteria included both male and female students who attend Saudi school in Newcastle upon Tyne. All grades within a range of age 6 to 17 years. Participants

who had been residing less than six months in the city were not collected in this study. The original number of Saudi students was about 138 males and females; however, only 65 students were recruited. Permission to conduct this study was obtained from the Newcastle educational centre. A questionnaire was designed to collect data from the study group, describing lifestyle and behavioural activities. The questionnaire was based on, reflecting demographic characteristics, dietary pattern, and some health-related lifestyles. individuals completed the questionnaire form; however, for younger students (6-10 years) the form was completed by the parents. Questions discussing dietary patterns amongst the pupils were divided into dietary habits and variables related to the intake of food items where it was calculated using frequency, to examine the weekly intake of various foods; although, for milk and cheese, number of cups and slices consumed per day was requested. By doing so, food consumption pattern, variety of food, and texture was visible. Other variables including health related lifestyle questions were asked such as: smoking (smoker or non-smoker); time spent practicing physical exercise, studying, TV watching, playing computer games (including video games and hand-held digital games), and sleeping; and fast food consumption.

Anthropometric measurements were taken after the completion of the questionnaire and measurements were conducted by the researcher. Body mass index (BMI) was calculated in weight in kilograms divided by height in meters squared. Anthropometric z-scores were computed for students relative to the World Health Organization (WHO)/National Center for Health Statistics (NCHS) reference population (Dibley *et al*., 1987). As WHO (1995) recommended, children and adolescents that are more than 2 standard deviations above the mean as weight-for-height z-scores define obesity. On the other hand, overweight was defined as a z-score value more than one standard deviation above the mean. The definition of underweight as z-scores more than 2 standard deviation below the reference mean weight for height (WHO, 1995). Data were analysed using SPSS Inc., version 25, Chicago, IL, USA. Data were presented as means and standard deviation (SD), Comparisons between groups, such as between male and female, were carried out using in-dependent-samples *t*-tests. A non-parametric Chi square test (χ^2) was used for comparison of categorical data. All differences were considered significant if P-values were < 0.05.

3. Results:

The study sample was 65 students, 23 (35.4%) were males and 42 (64.6%) were females. The mean ±SD ages of males and female subjects for primary students were 9.1 ±2.4 years and 9.3 ±3.6 years, for secondary students were 13.2 ±5.1 years and 13.9 ±2.7 years and for high students were 16.5 ±1.1 years and 16.6 ±2.3 years, respectively. The age range for these students is 6-17 years. Mean ± SD of the anthropometric variables are presented in Table 1. BMI values ranged from 17 to a maximum of 30 kg/m^2 across both genders. Around half of the subjects were underweight (n =29), in contrast 8% were overweight. There were significant differences between males and females in height, weight and BMI ($P < 0.05$).

Table 1: Anthropometric characteristics according to gender in different educational grades (mean ±SD)

Characteristics	Grades					
	Primary		Secondary		High	
	Male (n=10)	Female (n=15)	Male (n=10)	Female (n=20)	Male (n=3)	Female (n=7)
Age (years)	**9.1 ± 0.4**	**9.3 ± 1.1**	**13.2 ± 0.8**	**13.9 ± 1.2**	**16.5 ± 0.3**	**16.5±1.1**
	N.S		**N.S**		**N.S**	
Weight (kg)	**36.1 ±25.3**	**33.2 ± 8.9**	**51 ± 15.3**	**41.1 ±12.8**	**64.6 ±61.2**	**54.5 ±14.3**
Height (cm)	**144.5 ±7.7**	**136.1 ±9.2**	**154.9 ±9.4**	**147.3 ±9.5**	**168.8 ±6.5**	**155.4 ±6.9**
BMI (kg/m^2)	**17.4 ±12.4**	**17.9 ±3.4**	**21.5 ±5.4**	**19 ±4.7**	**22.8 ±8.5**	**22.6 ±6.1**
	($p < 0.05$)*		**($p < 0.05$)***		**($p < 0.05$)***	
BMI Classification, No. (%)						
Underweight	**6 (60)**	**10 (67)**	**2 (20)**	**10 (50)**	**0**	**1 (14)**
Normal	**4 (40)**	**5 (33)**	**7 (70)**	**9 (45)**	**2 (67)**	**4 (57)**
Overweight	**0**	**0**	**1 (10)**	**1 (5)**	**1 (33)**	**2 (29)**
Obese	**0**	**0**	**0**	**0**	**0**	**0**
	N.S		**($p < 0.05$)****		**N.S**	

SD: Standard Deviation. BMI: Body Mass Index. N.S: not significant

* $P < 0.05$ variables were compared by *t* test. ** $P < 0.05$ variables were compared by χ^2 test.

Table 2: Prevalence of dietary habits according to gender in different educational grades

Dietary Habits	Grades					
	Primary		Secondary		High	
	Male (n=10) No. (%)	Female (n=15) No. (%)	Male (n=10) No. (%)	Female (n=20) No. (%)	Male (n=3) No. (%)	Female (n=7) No. (%)
Breakfast meal						
Daily	10 (100)	13 (87)	8 (80)	15 (75)	2 (67)	5 (71)
sometimes	0	2 (13)	2 (20)	5 (25)	0	2 (29)
Never	0	0	0	0	1 (33)	0
	N.S		N.S		($p < 0.05$)*	
Drinking milk with breakfast						
Daily	9 (90)	11 (73)	3 (30)	4 (20)	0	1 (14)
sometimes	1 (10)	3 (20)	4 (40)	13 (65)	2 (67)	3 (43)
Never	0	1 (7)	3 (30)	3 (15)	1 (33)	3 (43)
	N.S		($p < 0.05$)*		($p < 0.05$)*	
Consumption of dates						
Daily	0	0	0	0	0	0
sometimes	7 (70)	10 (67)	6 (60)	11 (55)	1 (33)	2 (29)
Never	3 (30)	5 (33)	4 (40)	9 (45)	2 (67)	5 (71)
	N.S		N.S		N.S	
Frequency of daily meals	2.1 ± 1.6	3.2 ± 0.6	2.9 ± 0.3	3.2 ± 0.6	3.2 ± 0.11	2.9 ± 0.8
	($p < 0.05$)**		($p < 0.05$)**		($p < 0.05$)**	

N.S: not significant

* $P < 0.05$ variables were compared by χ^2 test. ** $P < 0.05$ variables were compared by t test.

Table 3: Food intake frequencies according to gender in different educational grades (mean ±SD)

Food Items	Grades						
	Primary		Secondary		High		Total (n=65)
	Male (n=10)	Female (n=15)	Male (n=10)	Female (n=20)	Male (n=3)	Female (n=7)	
Cups of milk (number/day)	1.5 ±1.4	1.2 ±2.1	1.2 ±1.2	1.2 ±1.3	0.4 ±0.7	0.7 ±1.4	1.1 ±1.4*
Cheese slices (number/day)	2.1 ±1.1	1.6 ±1.4	1.7 ±0.3	1.6 ±1.4	1.7 ±1.7	1.0 ±0.4	1.6 ±1.1*
Bread (times/day)	2.5 ±1.7	2.7 ±1.2	2.6 ±1.4	2.2 ±1.5	2.7 ±0.4	1.9 ±0.6	2.4 ±1.1*
Meat or poultry (times/week)	4.2 ±1.4	4.3 ±2.4	4.7 ±2.1	4.1 ±1.1	5.0 ±2.8	3.4 ±1.4	4.3 ±1.9*
Fish (times/week)	2.1 ±1.8	2.2 ±0.6	1.3 ±1.5	1.3 ±1.1	1.3 ±1.1	1.2 ±1.2	1.6 ±1.2*
Rice (times/week)	6.1 ±2.5	5.8 ±2.6	5.2 ±2.4	5.1 ±2.1	5.8 ±1.1	5.8 ±4.2	5.6 ±2.5*
Traditional food (times/week)	1.1 ±0.3	1.2 ±0.7	2.1 ±1.2	1.4 ±0.9	2.1 ±1.6	1.4 ±0.9	1.6 ±0.9*
Vegetables (times/week)	4.1 ±1.4	3.8 ±2.4	4.9 ±3.9	3.7 ±3.1	3.5 ±1.1	5.1 ±3.9	4.2 ±2.6*
Chips (times/week)	2.3 ±0.4	2.1 ±0.7	3.1 ±1.0	1.9 ±0.4	2.9 ±1.9	1.8 ±1.4	2.4 ±1.0*
Biscuit (times/week)	3.4 ±1.1	3.5 ±1.6	3.4 ±2.4	2.4 ±2.1	2.4 ±0.6	2.5 ±1.3	2.9 ±1.5*
Sweet (times/week)	2.6 ±1.4	3.5 ±1.1	2.1 ±1.1	3.1 ±2.6	2.5 ±2.0	2.6 ±0.9	2.7 ±1.5*
Fast food (times/week)	1.3 ±1.0	1.2 ±0.4	2.4 ±0.4	2.3 ±2.1	3.1 ±1.4	2.9 ±2.1	2.2 ±1.2*
Beverages (times/week)	4.2 ±0.4	4.6 ±2.1	4.8 ±3.1	5.1 ±1.4	4.7 ±1.3	4.9 ±1.3	4.7 ±1.6*
Canned juice (times/week)	5.1 ±1.9	4.1 ±1.3	3.8 ±1.7	3.5 ±1.6	4.0 ±4.3	3.1 ±0.9	3.9 ±2.0*

Cup of milk =200 ml

* $P < 0.05$ variables were compared by t test.

Table 2 shows dietary habits in both genders in different educational grades. The majority of students, at different grades, are eating breakfast, it was revealed that only one male student in high school never ate breakfast. Breakfast was found to be an everyday meal for 92% of students in primary school, although 77% for students in secondary school. Breakfast showed a significant gender difference only

between high school students. 43% of the participants were found to consume milk on a daily basis, with more female students never drinking milk with breakfast than male students ($P < 0.05$).

The mean intake frequencies of common food items for male and female students of different grades are shown in Table 3. The mean frequency of milk and cheese was 1.1 ±1.4 cups/day and 1.6 ±1.1 slices per day respectively; the least frequent was amongst high school females. The average consumption of meat per weak was 4.3 ±1.9; where the highest consumption was amongst males in secondary and high school. In comparison to carbohydrates, proteins, dairy and fats, vegetables have the lowest intake (4.2 ±2.6 times/week). Table 4 shows lifestyle and activities that linked to health. The number of hours sleeping during school days were less than that of the weekend but more than vacation day (8.3 ±2.1, 8.4 ±2.6, and 8.2 ±1.7 hours/day respectively). Female had a mean number of studying hours significantly more than male. The mean time spent by students in practicing physical exercises was 1.5 ±0.5 hours/day. Only one male student was found smoking in high school. Comparison between the three categories of BMI and dietary pattern, normal students were eating significantly more meals than underweight students with 2.9 ±1.1 meals compared to 2.5 ±1.9 meals, ($P < 0.05$). On the other hand, there was no significant difference in meals number between normal and overweight (3.0 ±0.9 meals).

Table 4: lifestyle variable according to gender in different educational grades (mean ±SD)

Food Items	Grades						Total (n=65)
	Primary		Secondary		High		
	Male (n=10)	Female (n=15)	Male (n=10)	Female (n=20)	Male (n=3)	Female (n=7)	
Sleeping hours (weekday)	**9.1 ±1.2**	**9.5 ±2.2**	**8.6 ±2.4**	**7.8 ±3.4**	**7.2 ±1.4**	**7.8 ±1.7**	**8.3 ±2.1***
Sleeping hours (weekend)	**9.4 ±3.4**	**9.1 ±4.0**	**9.2 ±2.7**	**8.8 ±2.4**	**6.9 ±0.9**	**7.5 ±2.1**	**8.4 ±2.6***
Sleeping hours (vacation day)	**8.8 ±2.1**	**8.7 ±3.1**	**8.5 ±0.7**	**8.7 ±2.2**	**7.0 ±0.7**	**7.5 ±1.4**	**8.2 ±1.7***
Study hours per day	**0.3 ±0.1**	**0.4 ±0.1**	**0.5 ±1.0**	**0.8 ±0.2**	**1.0 ±0.2**	**1.5 ±1.2**	**0.8 ±0.5***
TV watching (hours/day)	**1.1 ±0.1**	**1.4 ±0.8**	**1.6 ±0.7**	**1.2 ±0.9**	**1.4 ±1.9**	**2.1 ±1.0**	**1.5 ±0.9***
Computer games (hours/day)	**1.4 ±0.2**	**0.5 ±0.1**	**1.8 ±0.1**	**1.1 ±0.4**	**2.1 ±0.9**	**1.0 ±0.7**	**1.3 ±0.4***
Physical activity (hours /day)	**1.2 ±0.2**	**1.1 ±0.5**	**2.1 ±0.5**	**1.5 ±0.2**	**1.5 ±0.7**	**1.4 ±0.9**	**1.5 ±0.5***
Smoking (%)	**0**	**0**	**0**	**0**	**1 (33)**	**0**	**1 (1.5)**

* $P < 0.05$ variables were compared by *t* test.

4. Discussion:

In this study, we investigate the effect of lifestyle and nutrition and the impact on health among Saudi school students living in Newcastle, UK. When moving to live in the new location, new food habit should be adapted, because the new location might have different weather, culture, living cost, and living habits. Furthermore, it appears that the foundations of adult lifestyle are linked to the patterns of adjustment in childhood and adolescence (Ronka and Pulkkinen, 1995). When adolescence is reached, there are several influences on eating habits and making new habits is extremely complex. Lifestyle changes are endorsed to prevent and control obesity in childhood, such as increasing physical activity, shorting TV and computer use, and establishing a healthy dietary habit, including the consumption of fruits and vegetables, eating breakfast, and prevent the consumption of fast foods and sugary drinks. (Barlow, 2007).

The percentages of obesity and overweight among children and adolescent were high in Saudi Arabia (Alazzeh *et al*., 2018; Al Rukban, 2003 and Al Othaimeen *et al*., 2007). The WHO has recorded that in the Gulf region, over 50% of the population are overweight resulting from poor eating habits, low exercise as well as sedentary behaviour (Aljefree and Ahmed, 2015). On the other hand, our results showed that 48% of the students were normal weight, 44 % were underweight and only 8% were overweight. The current study, underweight was the most common nutritional problem among students, mostly amongst primary school male and female students. Underweight students consumed less food than those with a healthy weight. These results may be explained by moving to new country, the UK has a completely different eating habit because of availability of certain types of food, being busy with their families and cost of living expenses and unavailability of traditional food. Breakfast is usually referred to as the most important meal of the day, as in recent years it has been suspected to be involved in weight control, cardio-metabolic risk factors and cognitive performance (Gibney *et al*., 2018). Several studies suggest that poor school performance is associated with children missing breakfast (Taras, 2005). In our study, Saudi students had their breakfast with majority

between primary students then secondary students last in high students 92%, 77% and 70%, respectively. In contrast, breakfast skipping is common in Saudi Arabia, a study in Riyadh showed that 16.5% of the study subjects do not eat breakfast (Al Othaimeen *et al*., 1999), another study done in Jeddah reported skipping breakfast by 14.9% of school students (Abalkhail and Shawky,2002), and highly prevalent showed in study by Al Oboudi (2010) in Riyadh city with 23.33% do not eat breakfast at all or once a week. In Saudi Arabia, children do not have the chance to eat breakfast since the school start earlier where as in the UK they have the opportunity and sufficient time to eat the early meal. Regular consumption of milk in the study was found only in 49% of all students; 23% of students in the secondary grades, and 50% of high grades students never drink milk. These results are insufficient for these students and should be increased. Adolescents require 3 servings of milk and dairy products per day (one standard serving = one cup of whole milk or skim milk, one cup of yogurt, or 1.5 oz of cheese) to supply the body with sufficient amounts of calcium, vitamin D and riboflavin, also they decrease the risk of bone diseases. Date consumption in Saudi Arabia is an important religious and cultural habit, even when living abroad the Saudi families bring dates with them and encourage their children to consume them, as dates are rich in energy and nutrients. The dietary pattern these students show is rich in protein and carbohydrates but lacks fibre which is reflected by low vegetable consumption. Modifications to this habit should be done by decreasing the intake of certain food items, such as white rice, bread, and sweets, as well as increasing the intake of vegetables and other fibre-rich foods. Certain diseases such as gastrointestinal diseases including cancers, type 2 diabetes, and cardiovascular diseases may be prevented with consumption of fibres (Gidding *et al*., 2006). A recommended intake of 19-38 grams of fibre per day for healthy individuals over the age of 2 years (age 1-3: 19 grams, age 4-8: 25 grams, age 9-13: 26 grams for females and 31 grams for males) as indicated by the dietary guidelines for Americans (Gidding *et al*., 2006). An earlier study compared the consumption of carbohydrates in developed and undeveloped countries, with a similarity in the proportion of carbohydrates but the energy intake and type of carbohydrate was different. In developing countries, the carbohydrates from staple foods such as cereals and roots, composed mainly of starch, presented 85% of all carbohydrate intake, differing from the developed at 62% which was a result from carbohydrates from fruit and sugar found in developing countries (Shils *et al*., 1994). In the studied group, the major sources of carbohydrate were found to be white bread, rice, canned juice/beverages, sweets, and biscuits. Some of these sources have high levels of sugar making obesity and tooth decay more susceptible (Morikava *et al*., 2018). The intake of fast foods is the expected amount for these students (average 2 times a week). This is common due to the availability of these foods in western areas and their time saving characteristic, despite their minimal nutritional values. Furthermore, they accommodate excessive amounts of calories, sodium and fats, reduce essential nutrients (calcium, riboflavin, and vitamin A), and inadequate amounts of folate and fibre (Soo *et al*., 2018). Sleeping hours during school days and weekends are satisfactory but not in vacation days; the latter could be related to increased involvement between family due to returning to Saudi Arabia during vacation in the summer, in which a lot of physical activities and family time takes up their whole day and disturb the routine that was established in the UK where studying is a priority and occupies most of the time. This study showed that studying hours are not much (0.8 hours/day ±0.5) but high school student evidently showed longer time spent than primary students. This may be the system in UK education. Notably, the students did not spend a lot of time using computer games or watching TV, roughly an hour a day. Physical activity is important to the overall wellbeing of children and adolescent. This study revealed that Saudi living in the UK practiced higher levels of physical activity with (1.5 hours /day ±0.5), compared to Saudi children living in Saudi Arabia (Al Hazzaa, 2004), this may be explained by the weather in the UK being better for physical activity than in Saudi Arabia and Saudi schools do not have many physical activity programmes compared to UK schools. Usually, an empty area, like a yard at home, is most convenient for children to be physically active and lose the needless weight (Dunton *et al*., 2010). In addition, the family will provide adequate safety for children to play in their home yards. An Australian study found that children of ages 8 to 12 years old have most of their playing activities on home grounds (Cunningham *et al*., 1996).

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