PREVALENCE OF THINNESS CASES AND DIETARY DIVERSITY AMONG LEARNERS OF VARIOUS EDUCATION STAGES IN TAIF REGION, SAUDI ARABIA

Sami R[1,2]*, Bushnaq T[1,3], Radhi K[1], Benajiba N[4] and M Helal[5,6]

Rokayya Sami

Khadija Radhi

Nada Benajiba

Mahmoud Helal

*Corresponding author email: rokayya.d@tu.edu.sa

[1]Department of Food Science and Nutrition, College of Sciences, Taif University, P.O. 11099, Taif 21944, Saudi Arabia

[2]Department of Nutrition and Food Hygiene, School of Public Health, Harbin Medical University, Harbin, 150086 Heilongjiang, China

[3]Department of Health Professions, Faculty of Health, Psychology and Social Care, Manchester Metropolitan University, Manchester M15 6BG, UK

[4]Department of Basic Health Sciences, Deanship of Preparatory Year, Princess Nourah Bint Abdulrahman University, P.O. Box 84428, Riyadh 11671, Saudi Arabia

[5]Production and Mechanical Design Dept., Faculty of Engineering, Mansoura University, Mansoura, Egypt

[6]Department of Mechanical Engineering, Faculty of Engineering, Taif University, P.O. 11099, Taif 21944, Saudi Arabia

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ABSTRACT

Monitoring nutritional status during infancy, childhood, and adulthood is essential because good quality diet during growth is vital to cover the cognitive and physical demands, supply enough energy stores for illnesses and pregnancy and avoid adult nutrition-associated diseases. Thinness cases and lack of dietary diversity among learners in various education stages are common nutritional problems. A cross-sectional survey was carried out for the assessments of thinness cases and dietary diversity among the learners in various education stages in Taif Region, Saudi Arabia in August, 2020. A total of randomly selected 1602 respondents who fulfilled the exclusion and inclusion criteria (n=364 primary schools, n=410 middle schools, n=321 high schools, and n=507 university students) were examined and efficiently completed the survey. The survey comprised of socio-demographic characteristics, questions about health problems, adequate dietary diversity, habits, food item consumption, and nutritional knowledge test based on the student's theory and behaviors. The prevalence of thinness status among university students was very obvious (22%) and found to be mild followed by moderate (11%) and (0.4%) severely thin. The prevalence of severe thinness was the highest among primary school participants (28%). The prevalence of moderate thinness was reported slightly similar among middle and high school participants (29% and 32%, respectively). The highest prevalence of thinness cases was found in students from rural areas, while the lowest values were observed in those from urban areas. Students from large family size were more likely to be thin as compared to students from small size families. Students whose mothers were illiterate or had low formal education were more likely to be thin compared to those students whose mothers had completed university education or above. Further, 78% of primary school students reported meal skipping due to lack of appetite, while shape maintaining for the meal was accounted for 50% for middle school students as the main reason for the meal skipping. Snacking was also reported to be at a high rate among primary and high school students as 76% and 83% of the students mentioned having snacks, respectively. A higher frequency of light physical exercise was established for primary school pupils (81%), while university students reported (34%) as moderate. Almost all students had a low level of eating cereals, fruits and vegetables, while high schools and university students had a high-level consumption of fruits, animal-based foods and nutritional supplements. High school students had an excellent score 37% for nutrition knowledge. Education stage of learners was found to have direct influence on thinness, dietary diversity and food consumption frequency of the respondents. Consequently, nutritional education may positively affect the whole student's ability for good diet choices in the way to ensure a healthier status. The knowledge of nutrition education combined with physical exercise programmers may contribute to strengthening of the healthy eating messages at the various education stages.

Key words: thinness cases, education stages, dietary diversity, nutrition knowledge, Saudi Arabia

INTRODUCTION

Though the overweight prevalence is widely increasing, the underweight or thinness as malnutrition markers remain a health problem and can lead to the likelihood of chronic diseases or even mortality [1]. Malnourishment globally recorded 2.6 million death cases and more than 450 million somatic and mental children's failure per year [2]. Monitoring nutritional status during infancy, childhood, and adulthood is essential. Good quality diet during growth is vital to cover the cognitive and physical demands, supply enough energy stores for illnesses and pregnancy, and avoid adult nutrition-associated diseases [3]. Poor quality diet may delay puberty, the sexual development, lead to stunting, wasting, vitamins, and minerals' deficiencies especially in girls where they get married at an early age as sociodemographic customs [4,5]. Besides, it can be a reason for decreasing learning ability, impaired educational performances, talents, school attendance, perceptive and low concentration [6]. Socio-demographic characteristics such as age, residence, wealth index, parents' occupation, education, culture, water supply, hygiene, diarrhea episodes, and eating habits are the most frequently mentioned factors related to nutritional status [7,8]. Amuna and Zotor [9], conducted the socio-economic status related to US adolescent's nutritional status. Teji *et al*. [10,11] found that thinness cases were lower among urban regions (37.5%) than the rural region (39.3%). Wolde *et al*. [12] found that occupation and family size as other predictors to influence nutritional status. Warsito *et al*. [13] reported that low-quality diet can lower the educational performance (< 40%).

The objective of the present study was to evaluate cases of thinness and dietary diversity among various educational stages in order to develop targeted nutritional programs in Taif Region, Saudi Arabia.

MATERIALS AND METHODS

Sample size technique
A total of randomly selected 1602 respondents who fulfilled the inclusion criteria (n=364 primary schools, n=410 middle schools, n=321 high schools, and n=507 university students) were examined and efficiently completed the survey by the help of the homeroom teachers in schools and the university staff. All data were kept confidential as the student's names were not evidenced in the survey. Males were not included in this survey due to some Saudi Community traditions. Students were selected from various educational levels representing wide categories and living conditions in Taif Region, Saudi Arabia

Exclusion criteria
Students who were physically challenged, obesity cases, seriously ill, on a special diet, or even whose parents/guardians did not give the consent were excluded from the study. The obesity and overweight assortment frame, measurement, and results were explained according to the previous studies [14].

Design and subjects

The survey comprised of socio-demographic characteristics and questions about health problems, adequate dietary diversity, habits, food items consumption, and nutritional knowledge test based on the student's theory and behaviors.

Anthropometric measurement

Weight to the nearest 0.1 kg was estimated without shoes and with light clothes by a portable standing electronic scale with an ability to measure 0 - 150 kg, while height (m^2) was estimated by using a portable stadiometer (Seca 879, Germany). Students were positioned against a wall, barefooted, eyes were looking straight ahead and heads were positioned at the sightline to be perpendicular to the body. Body mass index (BMI) for the age and sex-specific was calculated as the weight to height squared ratio by WHO cut-offs, referring to thinness-based standards [15,16].

Data quality management

A pilot study was conducted and completed before starting the survey to test the validity of the questionnaire. The data collectors were trained on anthropometric measurements and ethical issues. English version of the survey was prepared, translated into Arabic, and then again back to English to check the consistency.

Data processing and statistical analysis

The completed data were entered, coded, and checked into Excel, then exported to IBM® SPSS® Statistics (Version 22.00) for analysis. Data were analyzed using the descriptive statistics and Pearson's chi-square test. The anthropometric measurements; weight, height, and BMI classes were converted to the nutritional status indices by using WHO Anthro Plus (Version 1.0.3). Covariates having a *p*-value ($P< 0.05$) were considered to be statistically significant for the independent variables as a cut-off point.

RESULTS AND DISCUSSION

Socio-demographic characteristics

Table 1 shows the scores for the socio-demographic factors among the learners of the different educational stages. The socio-demographic characteristics among respondents varied significantly ($P\leq0.05$) with educational stage. One hundred twenty-five who participated (1%, 4%, and 22% of middle, high and university students, respectively) were married. The majority (57%, 72% and 72% for primary, high school and university, respectively) of the students belonged to a large family size of more than five members. Approximately 59% of the middle school students belonged to smaller family size (< 5). The majority (more than 50% across the four categories) of the respondents were living in urban areas. Pertaining to family income per month, it was different for all the samples, while it can be noticed that, the higher the educational level attained, the more monthly income at a range of 5000-10000 RS\month equals 1300-2600$. Food expenses/month of 1500-4000 RS equals 400-1000$ was high among middle school students. Concerning maternal education, the majority recorded college and higher education except for middle school students who recorded (34%) for attending the primary school education. Besides, the majority of the fathers (more than 60%) in all education levels were government

employees and most mothers were housewives for all the educational stages except for middle school students who presented high percent as governmental employees (56%).
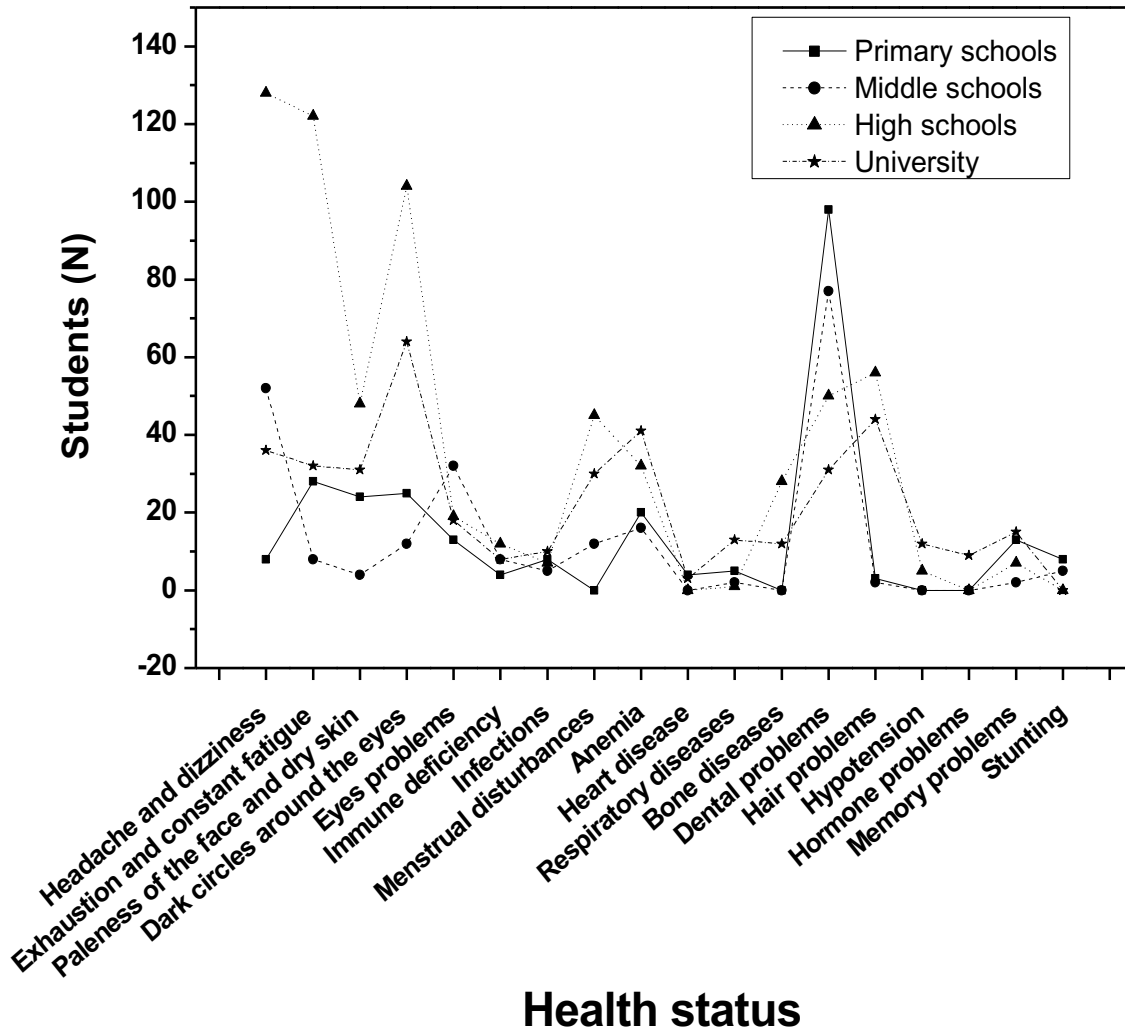

Figure 1: Distribution of Health Problems by Education stages

Health status
Results showed the most frequent symptoms of thinness status in descending order between various educational stages as headache and dizziness followed by exhaustion and constant fatigue, dark circles around the eyes, dental and hair problems (Figure 1).

Prevalence of thinness status
The overall prevalence of thinness cases is presented in Figure 2. Body mass index is considered as an essential parameter of nutritional status. Body mass index per age, according to WHO criteria, the prevalence of thinness status among university students was very obvious (22%) and found to be mild followed by moderate (11%) and (0.4%) severely thin. The prevalence of severely thin was the highest among primary school participants (28%) compared with the other education stages. The prevalence of

moderate thinness was reported slightly similar among middle and high school participants (29% and 32%), respectively.
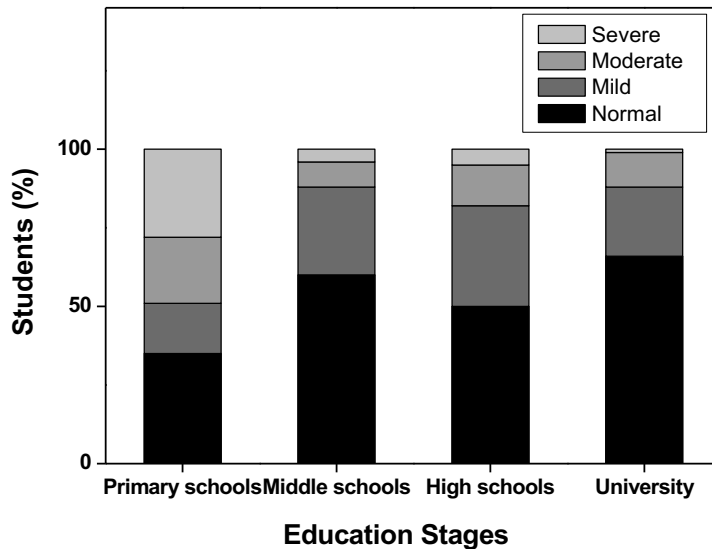

Figure 2 Prevalence of thinness status by education stages

Factors associated with thinness prevalence

Thinness can result from several factors such as social, ecological, regional, economic, socioeconomic status, dietary habit, diversity foods, care practices, illiteracy, and cultural differences [17]. Though, thinness was not significantly associated with the family size, wealth index, maternal education or even skipping meals. Thinness prevalence was significantly associated with the place of the family residence. The highest prevalence of thinness cases (67%) was found for students from rural areas, while the lowest values (46%) were observed from urban areas. The study finding was consistent with several studies from different findings [17-19]. Besides, females in rural areas are more involved in life duties than males that require extra energy expenditure [20]. Students from large family size were more likely to be thin as compared to students from small families. This finding was in agreement with findings from India and Ethiopia [21,22]. This could be due to food sharing and inadequate food consumption. Students whose mothers were illiterate or had low education were more likely to be thin compared to those students whose mothers have completed university or above, which places the whole family at risk of not achieving the nutritional needs. That indicates the importance of maternal education in improving the student's nutritional status as well as educational achievement. Furthermore, the increase in family income may influence the family member's nutritional status because they are likely to prepare good diets [23].

Dietary diversity and habits

Meal skipping was highly found among the middle school students which leads to thinness as compared to the other students in other educational levels who frequently ate ≥ 3 meals per day, (Table 2). The finding was in a line with the previous finding which mentioned that meal skipping can lead to inadequate dietary intake [20]. The adolescence

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period of the middle and high school students is characterized by greatest growth, so adequate nutrition is essential to enhance this growth. Further, 78% of primary school students reported meal skipping due to lack of appetite, while 50% of middle school students reported the maintaining of their body shape as the main reason for meal skipping. The most reported meal skipped by all the educational stages was breakfast (by more than 50%) followed by lunch and dinner, respectively. Snacking was noted to be at a high rate among primary and high school students (76% and 83%, respectively) of the students mentioned having snacks respectively. The questions about the number of days for physical exercise during the previous week at least 30 min were divided into four choices: none, referred to < 2 times was light, 2-4 times referred to be moderate, and > 4 times/week referred to be vigorous. Results were highly significant (P < 0.00). A higher frequency of light physical exercise was established for primary school students (81%), while university students reported (34%) as moderate. Our study was in line with Al-Nozha *et al.* [24] who assessed the levels of Saudis physical exercise.

Food consumption frequency

The food item consumption as assessed by a food frequency questionnaire was about the eating frequency during the previous week (Table 3). The results were summarized into two sets: Yes (%) referred to > 5 times/week and No (%) was < 5 times/week. According to the results, almost all the students had a low frequency of eating cereals, fruits, and vegetables, while high school and university students had a high frequency intake of fruits, animal-based foods, and nutritional supplements. The study was in line with previous studies [25,26]. Desouky *et al*. [27] mentioned that only 41% of Taif University students consumed adequate amounts of fruits and vegetables per week, as the monotonous diet lacks vital micronutrients leading to the body deficiencies burden. On the other hand, middle and primary school students had a low level of dairy food intake (20% and 50%), respectively. Calcium and vitamin D in cooperation may have an effect on the antigen-presenting immune cells (T and B) to adjust the immune responses and calcium and bone homeostasis (28). Besides, the authors thought that inadequate dietary diversity can be as a result of lack of parents/guardians and students' knowledge on a good quality diet as per recommended food groups.

Nutritional knowledge

The nutritional knowledge percent is shown in (Figure 3). True and right and multiple-choice questions were used to estimate the nutritional knowledge among students in various educational stages. High school students had an excellent score (37%) for nutrition knowledge test. Consequently, nutritional education may positively affect the student's ability for good diet choices in a way to ensure healthier nutritional status.
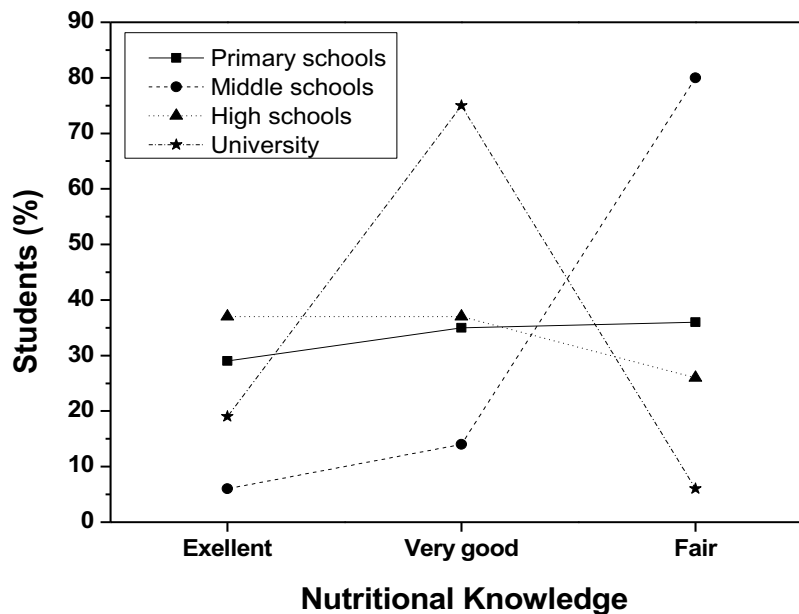
Figure 3: Nutritional knowledge rating for Primary schools (A), Middle schools (B), High schools (C) and University students

CONCLUSION

Educational stage of the respondents showed a significant influence on thinness and dietary diversity of the respondents. Dietary diversity and habits of respondents were influenced by educational stage. Food consumption frequency was affected by the respondents' educational stages. The learners in primary school stage seem to be at greater risk of thinness, lack of dietary diversity and low food consumption frequency, thus there should be need for school meals program to ensure that the young learners receive adequate nutrition. In the knowledge of nutrition education combined with physical exercise programmers may contribute to strengthening of the healthy eating message in various education stages categories.

Disclosure
The authors declared no conflicts of interest.

Ethical Approval
The study obtained the approval and written permissions from the ethical committee of Taif University boards (Number: 14-00197), the Ministry of Education and parents/guardians of the students > 18 years after the explanation of the study purpose by using a survey 7th July to 7th August, 2020.

Table 1: Socio-demographic characteristics

Variables	Primary schools (N)	(%)	Middle schools (N)	(%)	High schools (N)	(%)	University (N)	(%)	X² Trend Test	P-Value
Marital Status										
Single	364	100	405	94.1	301	94.1	394	79		
Married	0	0	4	1	13	4	108	22	157.8	0.00*
Divorced	0	0	1	0	2	1	4	1		
Widowed	0	0	0	0	1	0	1	0		
Family size										
5 < Members	155	43	240	59	91	28	136	27	181.2	0.00*
5 > Members	209	57	170	42	230	72	364	72		
Family Residence										
Urban	197	54	259	65	216	67	288	57	16.2	0.00*
Rural	167	46	151	38	105	33	219	43		
Family Income/Month										
1000-3000 SR	63	17	34	9	27	8	107	21		
3000-5000 SR	177	49	69	17	50	16	93	18	230.1	0.00*
5000-10000 SR	109	30	32	1	144	45	168	33		
Other	15	4	75	19	100	31	139	27		
Food Expenses/Month										
0-500	88	24	76	19	44	14	39	8		
500-1500	208	0	136	34	191	60	244	48	152.9	0.00*
1500-4000	44	12	163	41	78	24	168	33		
>4000	24	7	35	9	8	3	56	11		
Maternal Education										
Illiterate	38	10	97	24	63	20	122	24		
Primary	80	22	137	34	29	9	97	19	142.5	0.00*
Middle and secondary	109	30	92	23	58	18	119	24		
Collage and higher	137	38	84	21	171	53	169	33		
Mother Occupational Status										
House Wife	184	51	126	31	130	41	270	53		
Governmental Employed	127	35	224	60	104	32	97	19	173.2	0.00*
Privet Business	17	5	38	10	51	16	45	9		
Other	36	10	22	6	36	11	95	19		
Father Occupational Status										
Governmental Employed	248	68	325	81	199	62	340	67		
Privet Business	68	19	32	8	82	26	116	23	50.2	0.00*
Other	48	13	53	13	40	13	51	10		

SR= Saudi Riyal; *Means significant difference between categories at P > 0.05

Table 2: Dietary diversity and habits

Variables	Primary schools		Middle schools		High schools		University		X² Trend Test	P-Value
	(N)	(%)	(N)	(%)	(N)	(%)	(N)	(%)		
Eating frequency										
Once/day	15	4	20	5	6	2	12	2		
Twice/day	28	8	168	41	55	17	92	18	168.2	
Thrice/day	281	77	188	46	200	62	347	68		
> Thrice/day	40	11	34	8	60	19	56	11		
Meal skipping										
Yes	224	62	333	81	247	77	343	68	45.2	
No	140	39	77	19	74	23	164	32		
Meal skipped										
Breakfast	217	60	310	76	203	63	280	55		
Lunch	66	18	61	15	106	33	123	24	105.7	0.00*
Dinner	81	22	39	10	12	4	104	21		
Reason for meal skipping										
Lake of appetite	284	78	199	49	60	19	100	20		
Sickness	65	18	34	8	5	1	41	8	554.3	
Time limited	13	4	60	15	95	30	175	35		
Shape maintaining	2	1	117	29	161	50	191	38		
Having snakes										
Yes	276	76	263	64	267	83	245	48	128.3	
No	88	24	147	36	54	17	262	52		
Physical Exercise										
None	20	6	17	4	40	13	18	4		
Light	295	81	272	66	240	75	290	57	160.7	
Moderate	47	13	114	28	22	7	177	35		
Vigorous	2	1	7	2	19	6	22	4		

*Means significant difference between categories at P > 0.05

Table 3: Food consumption frequency

Variables	Primary schools		Middle schools		High schools		University	
	Yes (%)	No (%)	Yes (%)	No (%)	Yes (%)	No (%)	Yes (%)	No (%)
Do almost all of your diet have cereals?	34	66	12	88	46	54	8	92
Do almost all of your diet have vegetables?	41	59	15	85	41	59	45	55
Do almost all of your diet have fruits?	4	96	27	73	58	42	87	13
Do almost all of your diet contain animal-based foods?	22	78	28	72	78	22	73	28
Do almost all of your diet contain dairy foods?	50	50	20	80	50	50	81	19
Do you always take nutritional supplements?	50	50	27	73	72	28	73	27

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