

# Students health status related to their diary intakes: case study in Jazan, Kingdom of Saudi Arabia

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## Abstract

**Background:** During the last decades, malnutrition becomes a serious health problem. Many studies are interested to the relationships between malnutrition and several noncommunicable diseases.

**Objective:** To investigate the eating habits of some students in Jazan, south region of Saudi Arabia Kingdom and their health status.

**Materials and Methods:** The students were asked to answer a questionnaire. Then blood samples were taken to do some biochemical parameters analysis.

**Result:** This study reveals anemia, underweighting, hypocholesterolemia, and vitamin D deficiency within these students.

**Conclusion:** This original study proved that (1) counseling program toward health and nutrition should be carried out with these students and (2) more research should be conducted in this field.

**KEY WORDS:** students, malnutrition, health problem, hypocholesterolemia, vitamin D deficiency

**Abbreviations:** ALT, *alanine aminotransferase*; Alb, Albumin; ALP, *Alkaline phosphatase*; AST, *aspartate aminotransferase*; BMI, body mass index; BP, Biochemical parameters; Hb, hemoglobin; LDH, *lactate dehydrogenase*.


## Introduction

During the last decades, several health problems were observed, for example, obesity, abnormal thinness, hepatic problem, abnormal biochemical status, cancer, etc. Most of these problems were attributed to malnutrition.<sup>[1]</sup> Malnutrition is related to either metabolic or enzymatic problems, insufficient quantity of food or lack of diversity in eating components. Even in wealthy nations, malnutrition becomes a serious public health problem and this could be result of human evolution. Since, during human history, access to food and people alimentation habits change a lot. Man passes from hunter-gatherer to subsistence farmer and then from being self-sufficient to dependent on manufactured and processed food.<sup>[2]</sup>

Normally, a healthy diet must provide the body with adequate calories and essential nutrients, such as, vitamins, amino acids, fatty acids, and minerals. But, in the last decades, it was observed that some eating habits can provide enough calories, but not enough of essential nutrients needed to grow, function, and stay healthy.<sup>[3]</sup>

Many scientists investigate relationships between people alimentation habits and their health status.<sup>[1]</sup> A lot of these researches were directed to children and elderly people alimentation.<sup>[4]</sup> However less was concerned by students' alimentation habits during university period.<sup>[5]</sup> Although students represent an important portion of the society and during university period, they acquire special eating habits. Since, they spend more than 8 h in college, the majority of them do not consume more than two meals a day, neglect breakfast, do not eat fruit or vegetables, depend on snacks, etc. As a result, during university period, many symptoms of health problems can be developed (e.g., obesity, underweighting, metabolic problem, abnormal biochemical status). Later, these alterations could be related to the appearance of several noncommunicable diseases such as diabetes, anemia, cancer, and some psychiatric illness.<sup>[6]</sup>

The aim of this study was to investigate student's alimentation in Girls' Academic Campus in Jazan University and

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their health status. A total of 182 girls, aged 19–21 years, were concerned in this study. They were asked to answer a questionnaire related to their eating habits. Then, blood samples were taken to do some biochemical analyses. During this study, several parameters were considered such as students' alimentation, their body mass index (BMI), hemoglobin levels, hepatic enzymes, cholesterol level, and vitamin D level.

## Materials and Methods

### Study Design and Sampling

This study was carried out in girls' Academic Campus in Jazan University, Kingdom of Saudi Arabia. The target population was 182 level 1 students aged 19–21 years. During the study period, these students were at first level. This study was in the context of a research project financed by Jazan University. Its purpose was explained to the students and verbal and written consents were signed. All participants were consented to fill the questionnaire and they agreed to donate blood samples for analysis.

### Ethical Points

Official approvals were obtained from the ethics committee of Jazan University, and from the vice dean of the college of Girls' Academic Campus. Verbal and written consents were obtained from all the respondent students before participating in the study.

### Study Tool

A self-reported questionnaire was administered to all students. Information obtained included: (1) weight and economic status; (2) health screening, if they suffer from any disease or if they are under any medication; (3) nutritional screening: frequency of their meals, nature of the most consumed aliments, and fruits and vegetables consumption. The students were informed about the study and were given instructions on how to fill out the questionnaire completely and truthfully.

### Anthropometry Measurements

Anthropometric measurements were performed by trained staff using standardized techniques and equipment according to the International Society for the Advancement of Kinanthropometry.<sup>[7]</sup> Participants were measured barefoot and in minimal clothing. Body weight was recorded to the nearest 0.1 kg with a digital balance (Beurer living GS5) and body height with a Holtain Stadiometer (Holtain, Crymych, UK) to the nearest 0.1 cm.

The participant's BMI was calculated as follows<sup>[8]</sup>: BMI = the weight in kilograms divided by the height in meters squared. Student was considered as underweight if her BMI is less than 18.5 kg/m<sup>2</sup>; normal if BMI = 18.5 to 24.99 kg/m<sup>2</sup>; overweight if BMI = 25 to 29.99 kg/m<sup>2</sup>; having mild obesity if BMI = 30 to 34.99 kg/m<sup>2</sup>; and having severe obesity if BMI > 35 kg/m<sup>2</sup>.

### Biochemical Assessment

Blood samples were taken for biochemical assessment. For blood samples, the students were asked to fast overnight and not consume any food except for clear water after supper/ dinner until giving the blood samples in the college clinic in the morning of the following day. Estimations of ASAT, ALAT, total cholesterol, LDH, PAL, Alb, hemoglobin, fasting blood glucose were made using clinical chemistry auto analyzer. Vitamin D level estimation was done in Al Borg Medical Laboratories. After the reports of the blood analysis were obtained, the students were informed individually about their BP, BMI, and laboratory results and advised accordingly.

### Statistical Analysis

Data were stored on a daily basis using statistical package for social sciences (SPSS), version 22. Data were expressed as mean and standard deviation (mean  $\pm$  SD). Data were subjected to Student's *t*-test for statistical significance. A *p*-value of <0.05 was considered statistically significant.

## Result

### Questionnaire Data Results

The results of this study [Table 1] showed that students are 35% from low-income families, 49% from middle-income families, and 16% from high-income families. 9% of these students are suffering sickle-cell disease, 6% are suffering abnormal thinness and only 2% have hypertension. The rest are safe and do not take any medical treatment. 16% use food supplements such as iron and folic acid.

For meals frequency [Table 1], about 46% of these students take only 2 meals/day, 40% take 3 meals/day, 7% have 4 meals/day, 4% have 1 meals/day, and 3% take more than 4 meals/day. For mealtime respect, 90% students confirm that they do not respect it and 83% of them neglect breakfast.

These students were asked also about the content of their food. The result of this question showed that pastry foods, rice, and confectionery are the most likely to be consumed. Fat consumption is likely to be reduced in chicken meat and French fries. Fruits and vegetables are almost absent and only 7% reported fruit consumption as dessert or snacks.

### BMI Results

Concerning BMI factor [Table 2], 28% students concerned during this study are underweight. 43% are normal, 17% are overweight, 9% had mild obesity, and 3% only had severe obesity.

### Hemoglobin and Hepatic Enzymes Results

Results showed that the hemoglobin level for 45% of these students is less than 12 g/L. For these students, the mean value recorded for this parameter is 11.7  $\pm$  0.2 g/L. Hepatic enzymes such as ASAT, ALAT, Pal an LDH are normal compared to control [Table 2].

**Table 1:** Sociodemographic characteristics, health status, and alimentary habits of the students ( $n = 182$ )

	N	%
Mean age in years	182	100
20 years		
Family income (Saudi Riyals)		
Low-income families	64	35
Middle-income families	89	49
High-income families	29	16
Health status		
Sickle-cell disease	16	9
Abnormal thinness	11	6
Hypertension	4	2
No disease	151	83
Food supplements		
Iron and folic acid	29	16
No supplements	153	84
Meals frequency		
1 meals/day	7	4
2 meals/day	84	46
3 meals/day	73	40
4 meals/day	13	7
More than 4 meals/day	5	3
Mealtime respect		
Yes	18	10
No	164	90
Breakfast neglecting		
Yes	151	83
No	31	17

#### Fasting Blood Glucose, Albumin, Cholesterol, and Vitamin D

Fasting blood glucose levels were normal for all the students. 30% of the students presented nonsignificant low albumin levels [Table 2]. However, about 40% of these students presented significant low cholesterol levels ( $p < 0.05$ ) and a significant vitamin D deficiency was registered within all the students.

#### Discussion

Balanced diet is the determinant key of human health and it affects directly his performance in all areas such as education and work. And, unhealthy diet is identified to be among the most important risk factors that can lead to many noncommunicable diseases such as diabetes, abnormal thinness, obesity, liver problem, abnormal biochemical status, and cancer.

During this study, 182 students at Girls' Academic Campus were considered. They were asked to answer a questionnaire about their diets and alimentary habits. The analysis of the questionnaire showed that snacks and fast food are the most consumed because they are inexpensive, familiar, and available all the day. Also, this increased fast food consumption is associated with greater intakes of soft drinks.

**Table 2:** Data for health indicators results of the students ( $n = 182$ ). Levels are presented mean  $\pm$  SD.

	N	%	Levels
BMI (kg/m <sup>2</sup> )			
Underweight	51	28	16.61 $\pm$ 1.08
Normal	78	43	20.75 $\pm$ 2.07
Overweight	31	17	26.7 $\pm$ 1.65
Mild obesity	16	9	32.46 $\pm$ 1.6
Severe obesity	6	3	36.7 $\pm$ 1.55
Hemoglobin (g/dL)			
Normal	100	55	12.01 $\pm$ 0.3
<12 g/L	82	45	11.7 $\pm$ 0.2
Hepatic enzymes (U/l)			
ALAT			
Normal	182	100	17.54 $\pm$ 3.06
Unusual	0	0	-
ASAT			
Normal	182	100	17.83 $\pm$ 4.57
Unusual	0	0	-
LDH			
Normal	182	100	159.11 $\pm$ 13.48
Unusual	0	0	-
PAL			
Normal	182	100	77.53 $\pm$ 19.62
Unusual	0	0	-
Fasting Blood Glucose			
Normal	182	100	88.42 $\pm$ 13.16
Unusual	0	0	-
Albumin (g/dL)			
Normal	127	70	3.818 $\pm$ 0.3
Low level	55	30	3.11 $\pm$ 0.15
Cholesterol (mg/dL)			
Normal	73	40	140–220
Low level	109	60	124 $\pm$ 10 <sup>x</sup>
Vitamin D (ng/mL)			
Normal	0	0	30–100
Deficient	182	100	8.5 $\pm$ 3.7 <sup>x</sup>

<sup>x</sup> significant difference compared to normal ( $p < 0.05$ ).

Furthermore, the majority of them takes only 2 meals/day and neglect breakfast. And, their answers confirm that their food is not diversified. Fruits and vegetables are totally absent in their alimentary habits. And this alimentary habit relies only on pastry, confectionery, chicken meat, and French fries. Other studies were interested to students' alimentary habits and reported same results. Befort et al. reported that many adolescents receive a higher proportion of energy from fat and/or added sugar and have a lower intake of vitamins, folic acid, fiber, iron, calcium, and zinc than is recommended.<sup>[9]</sup> Other studies, confirmed that they may skip meals because of irregular schedules, specially breakfast and lunch.<sup>[10]</sup> Others confirm that adolescent snack and these snacks are a major source of energy and nutrients, providing nearly one-quarter to one-third of total energy intake for many adolescents.<sup>[11]</sup>

Taken together, the result of this study confirms that these students are subjected to malnutrition. This alimentation does not provide enough lipids and vitamins such as vitamin B, vitamin C, etc.

Concerning biochemical analysis, the results showed normal FBG and normal hepatic enzymes levels. However, about quarter of these students are classified underweight and 45% are anemic persons. Also, all concerned students presented vitamin D deficiency. Furthermore, according to this study, 40% students present significant low levels of cholesterol.

The vitamin D deficiency observed in this study is in accord with many other researches.<sup>[12]</sup> Vitamin D status depends on the production of vitamin D<sub>3</sub> in the skin under the influence of ultraviolet radiation and vitamin D intake through the diet or vitamin D supplements. The serum 25-hydroxy-vitamin D (25(OH) D) concentration is the parameter of choice for the assessment of vitamin D status. As known, cholesterol is a precursor of 25(OH)D and may thereby affect circulating 25(OH)D concentrations.<sup>[13]</sup> In that field, many studies were interested in studying the relationships between vitamin D and cholesterol levels. According to Vitezova et al.,<sup>[14]</sup> diverse relations could be observed. The same authors reported that the effects of vitamin D on serum lipids might not be that straightforward since vitamin D metabolism and lipids metabolism are connected through multiple pathways. As conclusion, vitamin D status reflects the overall health status and is not be causally associated with blood lipids. In the USA, vitamin D deficiency is now recognized as an epidemic.<sup>[15]</sup> Since, vitamin D deficiency could cause many health problems. As example, in adults, vitamin D deficiency induces secondary hyperparathyroidism, which causes a loss of matrix and minerals, thus increasing the risk of osteoporosis and fractures.<sup>[15]</sup> Also, there is mounting scientific evidence that implicates vitamin D deficiency with an increased risk of type I diabetes, multiple sclerosis, rheumatoid arthritis, hypertension, cardiovascular heart disease, and many common deadly cancers.<sup>[15]</sup>

Concerning low level of cholesterol, it could be attributed to several causes; hyperthyroidism, malnutrition, certain drugs, low fat diet, and genetic factors.<sup>[16,17]</sup> Hypocholesterolemia could be congenital due to related-genes mutations.<sup>[18]</sup> Also, some researchers prove that this situation could be seen within people suffering sickle-cell disease.<sup>[19]</sup>

In this study, it is not possible to check relationships between genetic factors, sickle-cell disease, and hypocholesterolemia. Furthermore, in this study, concerned students do not have hyperthyroidism and are not under any medication. Thus, the cause of these low levels of cholesterol could be attributed to malnutrition.

According to many studies, low cholesterol can cause many damages such as memory impairment, depression, emotional instability, excessive anger, schizophrenia, and numerous other neuropathies and psychological disorders.<sup>[20]</sup> Also, people with hypocholesterolemia present a weak immune system.<sup>[21]</sup> They can develop pulmonary tuberculosis and they may have a higher risk of cancer.<sup>[21]</sup> Furthermore,

Burnett and Hooper demonstrated that oxidative stress increased with people suffering hypocholesterolemia.<sup>[22]</sup>

In Saudi Arabia, many studies dealt with hypercholesterolemia and its consequences on health.<sup>[23]</sup> But fewer studies were interested in hypocholesterolemia. Our study prove that it is very interesting to investigate more and more hypocholesterolemia in Jazan. Specially, Jazan has the highest rate of people suffering from sickle-cell disease and Kingdom of Saudi Arabia presents a high consanguinity rate.<sup>[24,25]</sup>

## Conclusion

This original study proved that (1) counseling program toward health and nutrition should be carried out with these students and (2) more research should be conducted in this field.

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## References

1. Gastalver-Martín C, Alarcon-Payer C, Leon-Sanz M. Individualized measurement of disease-related malnutrition's costs. *Clin Nutr* 2015;34:951–5.
2. Speth JD, Spielmann KA. Energy source, protein metabolism, and hunter-gatherer subsistence strategies. *J Anthropol Archaeol* 1983;2:1–31.
3. Powles J. Changes in disease patterns and related social trends. *Sot Sci Med* 1992;35:377–87.
4. Hecht C, Weber M, Grote V, Daskalou E, Dell'Era L, Flynn D, et al. Disease associated malnutrition correlates with length of hospital stay in children. *Clin Nutr* 2015;34:53–9.
5. Desouky DS, Omar MS, Nemenqani DM, Jabbar J, Tarak-Khan NM. Risk factors of non-communicable diseases among female university students of the Health Colleges of Taif University. *Int J Med Med Sci* 2014;6:97–107.
6. Abdel-Megeid FY, Abdelkarem HM, El-Fetouh AM. Unhealthy nutritional habits in university students are a risk factor for cardiovascular diseases. *Saudi Med J* 2014;32:621–7.
7. Stewart A, Marfell-Jones M, Olds T, De Ridder H. International society for the advancement of kinanthropometry: international standards for anthropometric assessment. Lower Hutt, New Zealand: International Society for the Advancement of Kinanthropometry, 2001.
8. Alberti KGM, Zimmet P, Shaw J. Metabolic syndrome: a new world-wide definition. A consensus statement from the International Diabetes Federation. *Diabetic Med* 2008;23:469–80.
9. Befort C, Kaur H, Nollen N, Sullivan DK, Nazir N, Choi WS, et al. Fruit, vegetable, and fat intake among non-Hispanic black and non-Hispanic white adolescents: associations with home availability and food consumption settings. *J Am Diet Assoc* 2006;106:367.

10. Neumark-Sztainer D, Story M, Ackard D, Moe J, Perry C. The "family meal." Views of adolescents. *J Nutr Educ* 2000;32:329.
11. Rockett HR, Berkey CS, Field AE, Colditz GA. Cross-sectional measurement of nutrient intake among adolescents in 1996. *Prev Med* 2001;33:27.
12. Sedrani SH, Al-Arabi K, Abanny A, Elidrissy A. Vitamin D status of saudis: IV. seasonal variations. *Saudi Med J* 1992;13:423–9.
13. Pang J, Poulter EB, Bell DA, Bates TR, Jefferson VL, Hillis GS, et al. Frequency of familial hypercholesterolemia in patients with early-onset coronary artery disease admitted to a coronary care unit. *J Clin Lipidol* 2015;9:703–8.
14. Vitezova A, Voortman T, Zillikens MC, Jansen PW, Hofman A, Uitterlinden AG, et al. Bidirectional associations between circulating vitamin D and cholesterol levels: The Rotterdam Study. *Maturitas* 2015;82:411–7.
15. Holick MF. The influence of vitamin D on bone health across the life cycle. *J Nutr* 2005;135:2739S–48S.
16. Franzblau A, Criqui MH. Characteristics of persons with marked hypocholesterolemia. A population-based study. *J Chron Dis* 1984;37:387–95.
17. Leren TP, Berge KE. Identification of mutations in the apolipoprotein B-100 gene and in the PCSK9 gene as the cause of hypocholesterolemia. *Clinica Chimica Acta* 2008;397:92–5.
18. Di Filippo M, Moulin P, Roy P, Samson-Bouma ME, Collardeau-Frachon S, Chebel-Dumont S, et al. Homozygous MTTP and APOB mutations may lead to hepatic steatosis and fibrosis despite metabolic differences in congenital hypocholesterolemia. *J Hepatol* 2014;61:891–902.
19. Glew RH, Casados J, Huang YS, Chuang LT, VanderJagt DJ. Correlation of the fatty acid composition and fluid property of the cholesteryl esters in the serum of Nigerian children with sickle cell disease and healthy controls. *Prostaglandins Leukot Essent Fatty Acids* 2003;68:61–8.
20. Wardle J. Cholesterol and psychological well-being. *J Psychosom Res* 1995;39:549–62.
21. Fuhrman B, Wolfowitz E, Brook JG. Cancer and hypocholesterolemia: tumor cells induce increased oxidative modification of LDL and enhanced LDL uptake by non-tumor cells. *Atherosclerosis* 1994;109:59.
22. Burnett JR, Hooper AJ. Vitamin E and oxidative stress in abetalipoproteinemia and familial hypobetalipoproteinemia. *Free Radic Biol Med* 2015;88:59–62.
23. Basulaiman M, El Bcheraoui C, Tuffaha M, Robinson M, Daoud F, Jaber S, et al. Hypercholesterolemia and its associated risk factors; Kingdom of Saudi Arabia, 2013. *Ann Epidemiol* 2014;24:801–808.
24. Kari JA, Bockenbauer D, Stanescu H, Gari M, Kleta R, Singh AK. Consanguinity in Saudi Arabia: a unique opportunity for pediatric kidney research. *Am J Kidney Dis* 2014;63:304–10.
25. Memish ZA, Owaidah TM, Saeedi MY. Marked regional variations in the prevalence of sickle cell disease and  $\beta$ -thalassemia in Saudi Arabia: findings from the premarital screening and genetic counseling program. *J Epidemiol Global Health* 2011;1:61–8.

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