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PREVALENCE OF BEHAVIORAL RISK FACTORS FOR NON-COMMUNICABLE DISEASES AMONG SECONDARY SCHOOLS STUDENTS IN AL- NAJAF AL- ASHRAF GOVERNORATE IN 2024

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ABSTRACT

Background: Non-communicable diseases are a serious global health problem. They share risk factors that increase the likelihood of developing these diseases. A large percentage of non-communicable diseases will be prevented if changes in these behaviors occur in early life. **Objective**: Measure the prevalence of nine behavioral risk factors for non-communicable diseases (smoking, four unhealthy diets, physical inactivity, drug and alcohol abuse, and insufficient sleep) during 2024 and assess their association with sociodemographic features of students. **Methods**: A questionnaire was constructed to gather data among secondary school students in the AL-Najaf governorate. After gaining ethical approvals, a cross-sectional study was conducted to interview 354 students in 50 secondary schools. Descriptive statistics and chi-square tests were used to analyze the data. **Results:** Most common risk factor was Low fruit and vegetables in 98.31% followed by high consumed soft drink in 83.3% of students. The prevalence of most behavioral risk factors was high since 69.77% of the participants had 5-7 risk factors and shows statistical significance with age, residency, parents' educational levels, mother's job, and income of the student's family. **Conclusions**: The prevalence of most of the risk factors studied was high. Most participants had at least two risk factors related to non-communicable diseases, which were more associated with students' families' sociodemographic features.

KEYWORDS: Non-communicable diseases (NCDs); Risk factors (RFs); Secondary schools' students.

INTRODUCTION

Non-communicable Diseases (NCDs) are increasing importance, as a total of 41 million were due to NCD deaths occurring globally in 2019. A group of risk factors (RFs) contribute significantly to the morbidity of NCDs.[1] NCDs are a significant health burden, especially in low- and middle-income countries (LMICs).[2] The annual statistics report of the Ministry of Health (2023) reveals the premature deaths from major NCDs was 2.7/1000 (Al-Najaf 3.4/1000).[3] NCDs in adulthood are often linked to behavioral RFs established early in life during adolescence.[4] Adolescence is a critical period, as it transitions the lifestyle and body from child to adult within it[5], since they get more freedom to make decisions that can influence their health and well-being.[6] In Iraq, the population estimate for the adolescent age group 10-19 yrs. in 2023 was 22.93% of the population (In Al-Najaf 23.55%).[3] Secondary education covers ages 12-17 yrs. Old.[7]

WHO classify RFs as:1. Non-modifiable RFs as Age, Gender, and Family history. 2. Behavioral RFs/Modified as: Physical inactivity, Tobacco, Alcohol use, Unhealthy diets. 3. Metabolic RFs: include raised BP; overweight/obesity; hyperglycemia; and hyperlipidemia. 4. Environmental contributors to NCDs like: sunlight and air pollution.[8]

One of behavioral RF that can affect the development of NCDs in future is Tobacco which is responsible for over 8 million deaths annually.[9] Among secondary school students in Suleimanya, the water pipe was the most used tobacco product.[10] In Baghdad, a study found that the duration of smoking was statistically linked to the development of COPD.[11] The use of tobacco was

significantly modifiable RFs for renal diseases.[12] Factors to initiating smoking among students were peer influence, parental behavior, and media exposure.[13] Also, Alcohol beverage caused approximately 2.6 million deaths globally in 2019.[14] In a study of HTN among Iraqis there was 3.6% of the subjects stated they consumed alcohol.[15] In a study on alcohol use in Baghdad, 16.7% of participants reached the criteria for alcohol abuse.[16]

Drug abuse often can go with one or more health issues like lung, heart, cancer and mental diseases. In 2016, 12 million individuals aged ≥ 16yrs. driving under the influence of drugs.[17] Low educational level associated significantly with drug abuse in a post-conflict study in Baghdad.[16] In addition, Physical inactivity, since 80% of adolescents didn't meet recommended physical activity levels (PA) globally.[18] WHO recommends the primary prevention of NCDs through PA at population level.[19] In a study of obesity of Medical and Paramedical Staff in al-Najaf, there is low PA 69.4% of those (56.8%) have BMI ≥25 kg/m2.[20] while 78.7% of teenagers were found physically inactive in a study among Teenagers in Mosul.[21] Physical inactivity was observed among secondary school students in Baghdad's Al-Rusafa, with a rate of 90.5%.[22] Another behavior is Sleep insufficiency; Adolescents typically need 8-10 hrs. sleep at night.[23] A case-control study in Zakho reveals that inadequate sleep increases the risk of HTN.[24] A study on the impact of using the internet and social media on sleep among secondary school students in Baghdad revealed that 36.4% of students experienced insufficient sleep.[25] An unhealthy diet is one of the key risks for the global burden of NCDs.[26] In Hilla study, patients who never/sometimes ate fruits had a higher percentage of obesity (significant statistically).[27] A study done in most governorates shows that most hypertensive participants (87.4%) reported not consuming salty and processed foods, which was significantly associated with the control of HTN.[15] A study in Baghdad found a strong link between eating fast food at home and their BMI.[7] The Study Aimed To study some behavioral RFs for non-communicable diseases among secondary school students in Al-Najaf Al-Ashraf governorate in 2024.

SUBJEECTS AND METHODS

A Cross-sectional study was conducted in Al-Najaf Governorate from February to December 2024.

Sample selection: The study population was secondary school students in Al-Najaf Governorate. A random sample of about 10% (50) secondary schools was chosen from a total of 498 schools in the governorate. Stratified random sampling was employed, as schools were divided into strata, and random number tables were used to select the required number of schools. As shown in Figure 2.1. Sample size calculated by using equation:

$$\text{Sample size (n)} = \frac{(z^2 * p * q)}{d^2} \quad \ldots\ldots .^{[22]}$$

$$\mathbf{n= (1.96)^2*0.133*(1-0.133)/ (0.05)^2 \approx 177}$$

Whereas: n: minimal sample size, p: proportion, Prevalence of smoking (the higher risk associated with annual death according to WHO) which was 13.3% according to the study of Baghdadi, Ghazwan A[22], Z: confidence level (1.96 at 95%) and d: the acceptable margin of error (0.05).

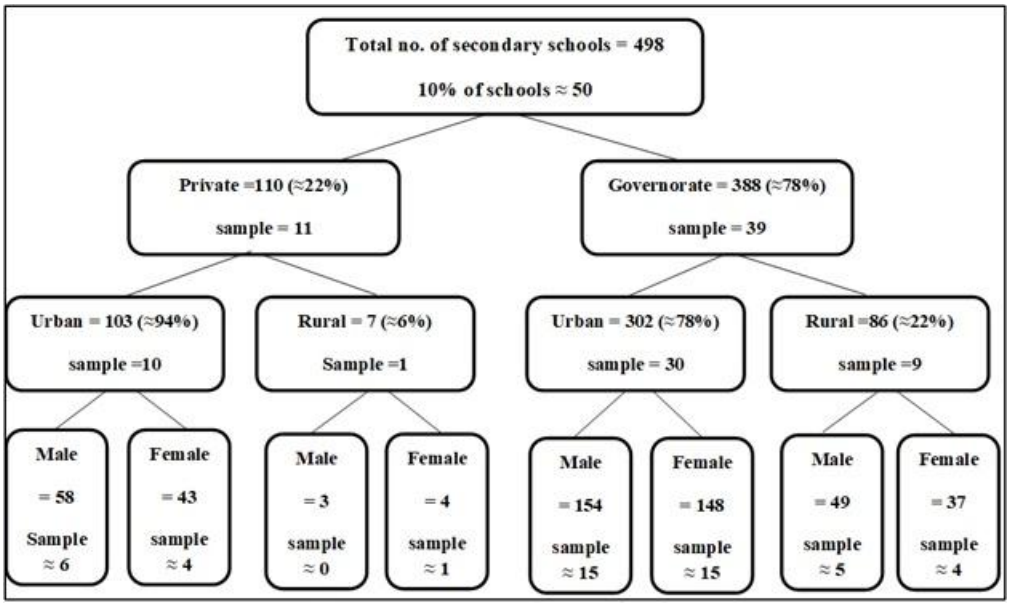

Fig.2.1: Flow chart representing sample selection for the study.

The sample size was doubled to 354 students for more representation & distributed evenly across the 50 selected schools & obtaining a list of students' names from the school's managers. These lists were then divided into Serata, students from each group were systematically selected.

Inclusion and exclusion criteria: All students 12-19 yrs. attending selected schools were eligible to participate in the study. Students > 19 yr., those with existing NCDs, and those who were absent during the review period or declined to participate were excluded.

Data collection: Based on a review of literature of closely related articles[4,6.10.13,22, 29] and WHO site.[30] A questionnaire was designed in alignment with the objectives and sent for the approval of the committee of local experts to ensure validity and includes 2 parts of information:

1/ Sociodemographic information about the participants includes: Age, sex, grade of students, level of education, type of school, residence, family income, marital state, additional work, academic performance, and parents' job and education. The socioeconomic features were categorized into two parts: the students' sociodemographic characteristics and the sociodemographic characteristics of the students' families. Age groups grouped since mean age was 15.81≈16 yrs., so dividing to 12-15 and 16-19 yrs. No. of brother group according to the mean Total fertility rate (for each woman) in Iraq 2.9 (in AL-Najaf 3.7) in the annual statistic report of Iraq's MOH 2023[3] so classified in 3 groups 0-2, 3-4 and above 4 and in same base adding 2 (parents) to classify no. of family. The income of families grouped according to Average Per Capita Income, which =5.856.600 dinars in 2021 (according to the Authority of Statistics and Geographic Information System (ASGIS)/Central Statistical Organization/Ministry of Planning.[31] Marital state was divided into whether students get married (previously/currently) or not. Students' academic performance was taken from the managers of schools and classified into 2 groups with cutoff point of 70 marks and more (i.e., excellent, very good and good performance) and less than 70 marks (intermediate and weak performance). Parents' education level was divided into 4 groups: not reading or writing, non-formal education - primary, secondary education (intermediate and Preparatory), and higher education (college and postgraduate).

2/ Nine behavioral RFs informations which includes questions about smoking, 4 dietary habits FVs intake, add salt before eating, fast food and soft drink consumption), physical inactivity, alcohol consumption, drug abuse, and insufficient sleep. The questions related to smoking, alcohol consumption, fruits, vegetable, salt, drug abuse, and physical inactivity were taken mainly from STEP-wise approach to NCD risk factor surveillance[30] of WHO in brief form to preserve the time while drug abuse, fast food and soft drink intake designed on bases of Global school-based student health survey (GSHS)[30] in brief form also. Questions on Sleep mainly from the Sleep Health Index (SHI) and insufficient Sleep Syndrome depending on the National Sleep Foundation (NSF).[23]

Then, the prevalence of RFs, such as smoking, alcohol consumption, and drug abuse, was assessed by determining whether students had ever engaged in these behaviors. While physical inactivity, according to WHO, adolescents should engage in at least 60 minutes of moderate- vigorous-intensity PA/day, on average, throughout the wk. or, vigorous-intensity activities should be included at least three days/week.[19] PA classified as no PA, less than recommended PA, recommended PA. Sleep insufficiency was classified with the least recommended hrs. (8-hr) duration/night as recommended by the NSF, so they grouped into < 8 hrs. sleep and ≥ 8 hrs. sleep at nighttime.[23]

Unhealthy diet, done in 3 groups: as low FVs consumption, the intake of FVs should be 5 servings per day according to WHO criteria, so it was divided as 0 servings, 1-4 servings and 5 or more servings/day.[26] Add salt to the food, whether students ever used it or not and frequency of adding salts done as 5 Likert scale (never, rarely, sometimes, often and always). High soft drinks and fast-food intake. classify whether participants use it or not and frequency of use is illustrated by wk.

Another tool aids us in gathering information about some habits. The researcher uses WHO show charts to illustrate to the students examples about types of food and some sports/activities. Each student has an individual interview conducted by the researcher, and filling out the questionnaire for each student typically requires 12-15 minutes.

Data management and analysis: The data collected was summarized and analyzed statically by statistical package for social sciences (SPSS) program version 26 and Microsoft excel 365. All factors analyzed to assess their relationships with sociodemographic features were evaluated using the chi-square ($\chi 2$) test, with p-values ≤ 0.05 considered significant. The cutoff points for determining the presence of RFs among each student were as follows: smoking, alcohol consumption, drug abuse, high soft drink consumption, and fast-food intake were analyzed based on whether the student had engaged in these behaviors or not. Physical inactivity and low FVs consumption were measured according to WHO recommendations. Sleep duration was categorized as < 8 hrs. or ≥ 8 hrs./night. The addition of salt, using a Likert scale, with scores < 3 or ≥ 3.

Ethical considerations**:** Ethical approval was obtained from the Iraqi Council of Medical Specialization and AL-Najaf Directorate of Education. Personal data confidentiality was ensured, and verbal consent from students was acquired in the presence of a teacher prior to participation.

RESULTS

Sociodemographic features of the students': study included 354 secondary school students with Mean age and SD were 15.81 ±1.86 (min = 12 and max 19 yr).

Males 184(52%), 286 (80.8%) had no additional job. Students from urban areas were 80.2% (284), and 78 % (276) belong to governmental schools. Table 1 shows more detailed sociodemographic features.

Table 1: Sociodemographic features of students.

Sociodemographic feature		Frequency (%)
Age group (year)	12-15	150(42.4)
	16-19	204(57.6)
Sex	Male	184(52)
	Female	170(48)
Level of education	Intermediate	182(51.4)
	Preparatory	172(48.6)
Marital status	Single	323(91.2)
	Married (current or previous)	31(8.8)
Student additional job	Yes	68(19.2)
	No	286(80.8)
Residence	Urban	284(80.2)
	Rural	70(19.8)
Class	1st class	62(17.5)
	2sd class	61(17.2)
	3rd class	57(16.1)
	4th class	62(17.5)
	5th class	53(15)
	6th class	59(16.7)
School type	Governmental	276(78)
	Private	78(22)
Academic performance	Excellent-good	255(72.1)
	Intermediate-weak	99(27.9)
Total		354(100)

Sociodemographic features of the students' families: Most students lived with both parents (83.1%). The Mean and SD family members was 6.83 ±2.11 (min = 2 and max = 18) while mean and SD of siblings was 3.35 ±1.49 (min = 0 and max = 8). Mean and SD of the family's Income (IQD) was 10.000.410 ± 5.120.960 (min = 3.000.000 and max = 36.000.000). More shown on table 2.

Table 2: Sociodemographic features of students' families.

Sociodemographic feature		Frequency (%)
Student lives with	Both parents	294 (83.1)
	Single parent	41 (11.6)
	Other	19 (5.4)
Family members	< 5	33 (9.3)
	5-6	134 (37.9)
	> 6	187 (52.8)
Siblings	< 3	104 (29.4)
	3-4	178 (50.3)
	> 4	72 (20.3)
Mother's education level	No read and write	31 (8.8)
	Non-formal education (read and write)- Primary	50 (14.1)
	Secondary (Intermediate- Preparatory)	160 (45.2)
	Higher education (college and postgraduate)	113 (31.9)
Mother's job	Employed	60 (16.9)
	Non-employed	242 (68.4)
	Self employed	52 (14.7)
Father's education level	No read and write	17 (4.8)
	Non-formal education (read and write)- Primary	32 (9)
	Secondary (Intermediate- Preparatory)	116 (32.8)
	Higher education (college and postgraduate)	189 (53.4)
Father's job	Employed	170 (48)
	Non-employee	16 (4.5)

	Self-employee	144 (40.7)
	Not present	24 (6.8)
Income (IQD/ yr)	Less than 5.856.600	24 (6.8)
	More or= 5.856.600	221 (62.4)
	Don't know	109 (30.8)
Total		354 (100)

Prevalence of behavioral RFs: Low FVs consumption shows the highest prevalent RF, 98.31% followed by soft drinks 83.3% then sleep < 8 hrs. at night 81.4%. No participants reported alcohol or drug abuse in this study. Table 3 illustrates the prevalence and some details of each RF.

Table 3: Prevalence and details of RFs among secondary school students.

Risk factors	Features	% (n.)	Total
Smoking	Prevalence of smoking		354
	Smoker	19.8% (70)	
	Non-smoker	80.2% (284)	
	Type of smoking		70
	Shisha	47.1% (33)	
	Manufactured cigarette	34.3% (24)	
	Electronic Cigarette	18.6% (13)	
Alcohol and Drug abuse	The prevalence of alcohol and drug abuse		354
	Use	0% (0)	
	Non- use	100% (354)	
Physical inactivity	Prevalence of Physical inactivity		354
	No PA	41.24% (148)	
	Less than recommended PA	33.62% (119)	
	Recommended PA	25.14% (87)	
	Types of PA on Regular sport		354
	Vigorous PA	13% (46)	
	Moderate PA	15.8% (56)	
	No PA	71.2% (252)	
	Types of PA on daily activities (or work)		354
	Vigorous PA	2% (7)	
	Moderate PA	34.7% (123)	
	No PA	63.3% (224)	
Insufficient sleep	Prevalence of Insufficient sleep		354
	Less than 8 hrs. at night	81.64% (288)	
	8 hrs. and more	18.36% (66)	
	Causes of sleeping < 8 hrs. at night		288
	Using electronic devices	43.06% (124)	
	Study	31.25% (90)	
	Work	11.81% (34)	
	Noisy environment	4.51% (13)	
	Caring for another person	3.82% (11)	
	Not right temperature	3.13% (9)	
	Multiple causes	2.43% (7)	
Low fruit and vegetables consumption	Prevalence of low FVs		354
	0 serving	31.36% (111)	
	1-4 serving	66.95% (237)	
	5 serving and more	1.69% (6)	
Added salt to the food	Prevalence of added salt		354
	Added	80.79% (286)	
	Not added	19.21% (68)	
	Frequency of added salt		354
	Always	12.71% (45)	
	Often	22.88% (81)	
	Usually	24.01% (85)	
	Rarely	21.19% (75)	

	Never	19.21% (68)	
	Types of salt used		286
	Table salt	90.56% (259)	
	Sea salt	6.24% (18)	
	Himalaya salt	1.75% (5)	
	Other	1.4% (4)	
Consumption of fast foods	Prevalence of fast food		354
	Consumed	79.7% (282)	
	Not consumed	20.3% (72)	
	No. of use / wk.		282
	Once	12.8% (36)	
	Twice	16.3% (46)	
	3 times	14.9% (42)	
	4 times	18.1% (51)	
	5 times	21.6% (61)	
	6 times	5.3% (15)	
	7 times	11% (31)	
Consumption of soft drinks	Prevalence of soft drinking		354
	Consumed	83.3% (295)	
	Not consumed	16.7% (56)	
	No. of use / wk.		295
	Once	12.2% (36)	
	Twice	10.8% (32)	
	3 times	7.5% (22)	
	4 times	11.2% (33)	
	5 times	16.9% (50)	
	6 times	12.5% (37)	
	7 times	28.8% (85)	

Since there was 0% alcohol consumption and drug abuse there were 7 behaviors registered among secondary school students and apart from only one student recording only one risk behavior, at least each student recorded 2 RFs for NCDs. The means of these RFs was 4.97±1.2(≈5) and they grouped as seen in fig.3.1

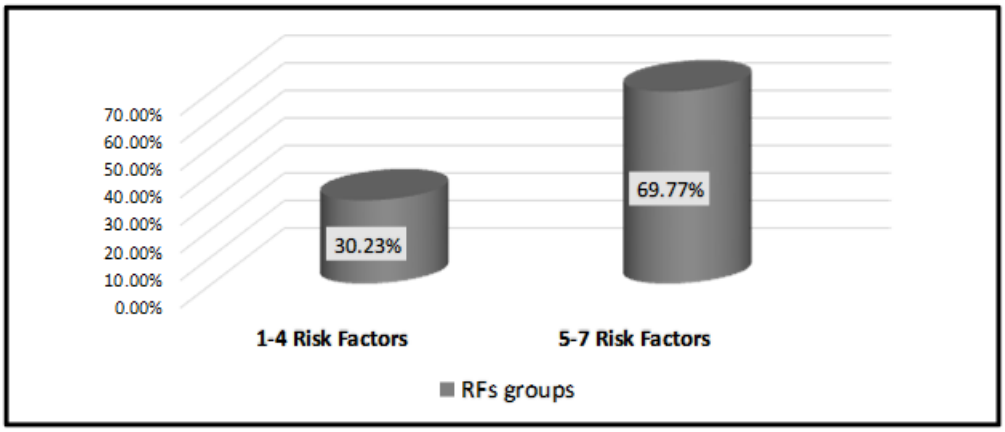

Fig. 3.1: Risk factors groups among secondary school students.

Relationship of behavioral risk factors with sociodemographic features of students were listed in table no. 4. It shows statistical significance on age groups/yrs. and residency of students with p-value less than 0.05 by using $\chi 2$ test since the students aged 16-19 yrs. and students who were from urban residence had 5-7 risk factors compared to those smaller age and from rural areas.

Table 4: Behavioral risk factors with sociodemographic features of students.

Sociodemographic feature		Risk factors n. (%)		Total n=354	P-value
		1-4 n=107	5-7 n=247		
Age group	12-15	54 (36%)	96 (64%)	150 (100%)	**0.043**

(year)	16-19	53 (26%)	151 (74%)	204 (100%)	
Sex	Male	52 (28.3%)	132 (71.7%)	184 (100%)	**0.402**
	Female	55 (32.4%)	115 (67.6%)	170 (100%)	
Marital status	Single	95 (29.4%)	223 (70.6%)	323 (100%)	**0.282**
	Married (current/previous)	12 (38.7%)	19 (61.3%)	31 (100%)	
Residence	Urban	75 (26.4%)	209 (73.6%)	284 (100%)	**0.002**
	Rural	32 (45.7%)	38 (54.3%)	70 (100%)	
Student additional job	Yes	23 (33.8%)	45 (66.2%)	68 (100%)	**0.472**
	No	84 (29.4%)	202 (70.6%)	286 (100%)	
Level of education	Intermediate	61 (33.5%)	121 (66.5%)	182 (100%)	**0.166**
	Preparatory	46 (26.7%)	126 (73.3%)	172 (100%)	
School type	Governmental	86 (31.2%)	190 (68.8%)	276 (100%)	**0.472**
	Private	21 (26.9%)	57 (73.1%)	78 (100%)	
Class	1st class	24 (38.7%)	38 (61.3%)	62 (100%)	**0.392**
	2sd class	18 (29.5%)	38 (70.5%)	61 (100%)	
	3rd class	18 (31.6%)	39 (68.4%)	57 (100%)	
	4th class	21 (33.9%)	41 (66.1%)	62 (100%)	
	5th class	12 (22.6%)	41 (77.4%)	53 (100%)	
	6th class	14 (23.7%)	45 (76.3%)	59 (100%)	
Academic performance	Excellent-good	74 (29%)	181 (71%)	55 (100%)	**0.428**
	Intermediate-weak	33 (33.3%)	66 (66.7%)	99(100%)	

Relationship of behavioral RFs with sociodemographic features of students' families were listed in table no.5. It is seen there was a statistical significance with p-value less than 0.05 with parents' educational levels, mothers' job and the income of the student's family, since students with parents' higher education level (college and postgraduate), employed mother and high income have 5-7 RFs than those with other groups.

Table 5: Behavioral risk factors with sociodemographic features of students' families.

Sociodemographic feature		**Risk factors no. (%)**		**Total n=354**	**P-value**
		1-4 n=107	**5-7 n=247**		
Student lives with	Both parents	88 (29.9%)	206 (70.1%)	294 (100%)	**0.053**
	Single parent	9 (22%)	32 (78%)	41 (100%)	
	Other	10 (52.6%)	9 (47.4%)	19 (100%)	
Family members	Less than 5	8 (24.2%)	25 (75.8%)	33 (100%)	**0.674**
	5-6	43 (32.1%)	91 (67.9%)	134 (100%)	
	More than 6	56 (29.9%)	131 (70.1%)	187 (100%)	
Sibling	Less 3	23 (22.1%)	81 (77.9%)	104 (100%)	**0.098**
	3-4	59 (33.1%)	119 (66.9%)	178 (100%)	
	More 4	25 (34.7%)	47 (65.3%)	72 (100%)	
Mother's education level	No read and write	15 (48.4%)	16 (51.6%)	31 (100%)	**0.038**
	Non-formal education (read and write)-Primary	18 (36%)	32 (64%)	50 (100%)	
	Secondary (Intermediate and Preparatory)	48 (30%)	112 (70%)	160 (100%)	
	Higher education (collage and postgraduate)	26 (23%)	87 (77%)	113 (100%)	
Mother's job	Employed	9 (15%)	51 (85%)	60 (100%)	**0.011**
	Non-employed	83 (34.3%)	159 (65.7%)	242 (100%)	
	Self employed	15 (27.4%)	37 (72.6%)	52 (100%)	
Father's education level	No read and write	7 (41.2%)	10 (58.8%)	17 (100%)	**0.012**
	Non-formal education (read and write)-Primary	17 (53.1%)	15 (46.9%)	32 (100%)	
	Secondary (Intermediate and Preparatory)	35 (30.2%)	81 (69.8%)	116 (100%)	
	Higher education (college and postgraduate)	48 (25.4%)	141 (74.6%)	189 (100%)	
Father's	Employed	46 (27.1%)	124 (72.9%)	170 (100%)	**0.474**

job	Non-employed	7 (43.8%)	9 (56.3%)	16 (100%)	
	Self employed	46 (31.9%)	98 (68.1%)	144 (100%)	
	Not present	8 (33.3%)	16 (66.7%)	24 (100%)	
Income in IQD / yr	Less than 5.856.600	11 (45.8%)	13 (54.2%)	24 (100%)	**0.040***
	More or= 5.856.600	57 (25.8%)	164 (74.2%)	221 (100%)	
	Don't know	39 (35.8%)	70 (64.2%)	109 (100%)	

* If exclude who they don't know p = 0.037

DISCUSSION

This study provides insights into the behavioral RFs contributed to NCDs among secondary school students in Al-Najaf governorate in 2024. In the study, Smoking prevalence was 19.8%, differing from rates reported in Baghdad (13.3%), Suleimanya (25.3%) and Karbala (25.3%).[22,10,29] Therefore, the smoking rate was higher than in Baghdad. This can be because smoking is encouraging behavior, so it increases to use it with time, but it is lower than in Karbala and Suleimanya, which May indicate that some students may deny smoking due to fear of punishment. Socially, Smoking is often seen as acceptable behavior and often relatively cheap and easily accessible, making it easier for young to start and continue smoking. The study didn't identify cases of alcohol or drug abuse, while in Erbil, 3.7% of students consumed alcohol and several drugs abused in percentages 0.1-1.3%. They used a large sample (3000 students) and a self-administered questionnaire.[32] Students may deny alcohol and drugs consumption due to social stigma and fear of consequences as they go against religious or cultural values. Approximately 75% of students don't follow the recommended PA/week, which agrees with study in Mosul when 78% of participants didn't follow PA recommendations.[21] In a study of diabetic adolescents in Hilla, 57.2% didn't do any activity. 23.3% of participants do activities for a periods, which approximately agree with the current study.[33] On the other hand, it is lower than in Baghdad (90%) and Suleimanya (89.7%).[22,10] Since they are big cities, students often have greater access to technology, i.e., more sedentary behaviors. Also, results were higher than in Duhok (55,8%)[34], which may be due to Geographic Factors, i.e., mountainous areas that offer natural environments for outdoor activities.

A majority (81.64%) of study participants slept < 8 hrs. and the most common reason was the use of electronic devices (40.06%). In Baghdad, insufficient sleep was 94.8% and significant statistically with hrs. spent using the internet.[25] In contrast Duhok[35] sleeping < 6 hrs. only 2%. This disagreement may be due to the Dohuk's research studies only female and use different cut-off point. Insufficient sleep was reported as 72.7% of students were getting < 8 hrs. sleep/nights USA.[36] Academic pressure, technology usage, poor time management may cause sleep < 8hr. Societies may encourage students to work hard at the expense of rest and sleep. Low FVs consumption as 98.31% did not meet the criteria of WHO and agree with the low FVs intake in Baghdad study, which was 90.6%.[22] A comparative study examining FV consumption patterns among adolescents in 49 LMICs revealed that Morocco stood out with the highest proportion of adolescents meeting the recommended daily FV intake, at 29.5%.[37] Personal preferences, peer and media influence, and factors like cost and lack of education about nutrition influence adolescents' low intake of FVs.

The study found a high percentage of students (80.79%) add salt to their food. This aligns with a Turkish study, which reported that 79.8% of students added salt to their food.[38] In Duhok, 56.4% never added additional salt to their food.[37] This disparity could be attributed to differences in sampling population (use youths aged 15-24 years and attended the Premarital Screening Health Clinic) or due to using too much salt during food processing and salty sauce instead. Adolescents may develop a preference for salty flavors due to frequent exposure to high-sodium foods. The study identified that Fast food consumption was reported by 79.7% of students and soft drinks were 83.3%. A study on food consumption among students in Duhok revealed that 70.8% of them drink soft drinks. Similarly, in Kirkuk, 94% of students consume fast food.[36,38] Despite different scales and the percentage of intake of fast food and soft drinks were highly consumed probably due to their convenience, affordability, taste appeal and limited nutritional knowledge all drives and the normalization of this consumption. This study shows 69.77% of students scored 5-7 risky behaviors, which may increase their risk of developing NCDs in future. Worldwide, prevalence of ≥ 4 NCD risk factors rose from 14.8% during 2003–2007 to 44% in 2013–2017.[5] A combination of greater independence, social pressures, hormonal change and lifestyle changes drives the increase in NCD risk factors during adolescence. These influences accumulate as adolescents grow older and Urbanization which introduces lifestyle changes that often contribute to unhealthy behaviors. While economic stability, parental education, and financial resources provide significant advantages, they can inadvertently increase risk behaviors through reduced supervision, increased access to resources and stress from high expectations. Future NCD risk factors will likely develop including prolonged use of digital and immersive technologies, exposure to novel environmental pollutants, reliance on engineered foods and chronic stress from constant connectivity.

Study Strengths: Adolescence is a critical phase for developing habits that can last a lifetime. By focusing on secondary school students, this study targets a key group whose behaviors during this period can significantly impact their long-term health outcomes and directly

address modifiable RFs for major NCDs, representing significant global health challenges. It contributes to policymakers developing interventions aimed at reducing the burden of NCDs.

Study limitations: Some behavioral RFs that may be underrepresented or not fully explored could be due to students' fear of answering, especially alcohol and drug abuse. More RFs like sexual behavior and violence on the development of NCDs among adolescents were difficult to study as it either embraced or other measurable tools to be estimated.

CONCLUSION

The prevalence of most of the studied RFs was high. Most of the participants had at least two RFs related to NCDs and approximately 70% of them had 5-7 RFs and the prevalence of RFs associated more with students' families' sociodemographic features in addition to students' age and residency.

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