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## Problematic internet use: Prevalence, determinants, and its relation with sleep quality among secondary school students in Zefta district, Gharbia governorate

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### Abstract

**Background:** Although the internet has offered advantages, the side effects of Internet overuse have been emerging progressively. The aim of this work was to determine the prevalence and determinants of problematic internet use (PIU), prevalence of sleep problems and to investigate the relationship between PIU and sleep quality among secondary school pupils.

**Methods:** This cross-sectional study carried on 1269 male and female pupils aged 14-18 years in secondary schools in Zefta District, Gharbia Governorate. PIU was assessed by Arabic young internet addiction test (A-YIAT), and sleep quality was assessed by Pittsburgh sleep quality index (A-PSQI).

**Results:** About half of pupils (47.5% and 1.4%) were moderate and severe problematic internet users respectively while 51.1% were little internet addicts or no addicts. The present results showed that risk factors of PIU were young age, male sex, parents' occupation, high educational level of parents, high family income, low academic score, none educational aims of internet use, domestic internet access, increased duration of internet use, increased number of SIM card, smoking, watching TV, drinking tea or coffee, using mobile before sleep, not having hobbies, using sleep medication and no parental monitoring. The current study also revealed that 60% of pupils were poor sleepers compared to 40% were good sleepers. More than four fifths (88.9%) of severe internet addicts were poor sleepers with statistically significant relationship between PIU and sleep quality among the participants.

**Conclusion:** PIU is prevalent and multifaceted problem among secondary school pupils. More than half of the studied pupils had PIU and sleep problems. PIU is inversely related to sleep quality.

**Keywords:** Problematic internet use, sleep quality, secondary school students, A-YIAT, PSQI

### Introduction

Today, the Internet has become an in-built part of daily lives of people including children and adolescents. The Internet can be used for many purposes: educational such as teaching, learning and research; business, such as monetary/document exchanges and conference meetings; recreational such as games, online gambling, and as a mode of connecting people via texting, calling, social websites, chat applications and e-mails <sup>[1]</sup>.

Although the internet has offered advantages, the side effects of Internet overuse have been emerging progressively <sup>[2]</sup>. The widespread use of cell phones and easy accessibility of the Internet worsen the issue <sup>[3]</sup>. Excessive usage of the Internet is associated with a psychiatric condition known as Internet Addiction (IA) or Problematic Internet Use (PIU) <sup>[4, 5]</sup>.

The term "addiction", traditionally utilized to describe a physical dependence of substances, has been applied to the excessive use of the Internet <sup>[6]</sup>. However, the appropriate classification of IA has been debated. Some investigators have linked IA to addictive disorders, grouping it alongside alcohol and drug use disorders <sup>[7]</sup>.

Teenagers with IA exhibit compulsive behaviour that is difficult to control. This could be explained by a few studies that reported a disturbance in the frontal region of the brain, especially the prefrontal dorsolateral cortex, the area responsible for cognitive function, motivation, and impulse control <sup>[8, 9]</sup>.

International estimates of IA mostly differ. The prevalence of PIU varies from 0.8% to 26.7% in different populations, with higher prevalence in adolescents and young adults <sup>[10]</sup>.

Sleep has a significant function in human lives for both physical and mental health. About one third of our life is spent sleeping. Good sleep is necessary for optimal health. It is one of the most important needs of human to revitalize energy and help physical appearance and

well-being<sup>[11, 12]</sup>.

The estimated prevalence of sleep problems is 27-40% in young adults<sup>[13]</sup>. For adolescents, sleep behavior is a component of daily life that has a major impact on physical and mental health<sup>[14]</sup>.

Cognitive Behavioral Therapy (CBT) is a type of psychotherapeutic treatment that helps people learning how to identify and change the destructive or disturbing thoughts that have a negative effect on their behavior and emotions<sup>[15]</sup>.

The response to treatment of IA is effective when addiction is early detected. CBT is the most effective psychological intervention applied together with family-based intervention and counseling programs<sup>[16]</sup>.

If IA is not intervened upon early, it may lead to adverse effects on both physical and mental health in young people. So, early detection of state of IA would hopefully help in prevention of its hazards and improvement of adolescent school performance.

The aim of this work was to prevent and control PIU among secondary school pupils, prevention of its side effects and improvement of school and learning environment.

### Patients and Methods

This cross-sectional study was carried out on 1269 patients, both sexes, who are active internet users since at least one year. The study was done from January 2021 to end of June 2021 after approval from the Ethical Committee Tanta University Hospitals, Tanta, Egypt. An informed written consent was obtained from all participants in the study.

Exclusion criteria were pupils not using the internet.

Data was collected using three questionnaire sheets:

**Part 1:** the basic socio demographic features, internet use data as number of SIM card, duration, purposes, and methods of access and lifestyle activities like smoking, drinking tea or coffee, watching TV, having hobbies, family monitoring regarding internet use, using hypnotics and using mobile before sleep.

**Part 2: Arabic version of Young Internet Addiction Test (A-YIAT):** It was validated in a preceding study conducted in Lebanon. This Arabic version showed good psychometric properties, with excellent internal consistency, reliability, with a Cronbach's alpha of 0.921<sup>[17]</sup>.

**Part 3: Arabic version of Pittsburgh Sleep Quality index (A-PSQI):** It included inquiry regarding student's quality of sleep by using A-PSQI. It is one of the popular and useful tools for evaluation of sleep quality in the last one month with verified levels of reliability and validity<sup>[18]</sup>.

### Scoring system of IA

YIAT is the first valid and reliable tool to measure addiction to internet. This 20-item questionnaire was developed by Kimberley Young in 1996. It classifies severity of IA into mild, moderate, and severe degrees<sup>[19]</sup>. Each answer is scored on likert scale from 1 to 5: score 1 = rarely, 2=occasionally, 3 = frequently, 4 = often, and 5 = always. The final score is obtained by summing up the scores of all questions (the total score ranges from 20 to 100 points). The greater score reflects a higher level of addiction. Scores between 20-49 are indicative of little or no internet addiction (it means normal user). Scores between 50-79 are indicative of moderate internet addiction. Scores between 80-100 are indicative of severe internet addiction.

### Scoring system of sleep quality

PSQI contains seven sleep components or domains (included in 19 questions regarding the sleep habits/problems of the adolescents), each of which carries a score of 0 to 3 that signifies the frequency of each condition mentioned in each item giving a range of scores between 0 and 21. The higher the score, the worse the sleep quality, PSQI score greater than five points for poor sleep quality<sup>[20]</sup>. The PSQI Arabic version was used which was translated and validated by Suleiman *et al.*<sup>[21]</sup>.

### The seven components assess different aspects of sleep quality

Subjective sleep quality questions the overall sleep quality within the last month. Sleep latency questions the time required for falling asleep at night in the last month and whether there is a problem in falling asleep within 30 minutes and its frequency. Sleep duration, questions how many hours they slept at night within the last month. Habitual sleep efficiency, questions when they sleep at night, when they wake up in the morning and how many hours they slept at night within the last month. Sleep disturbances, questions the presence and frequency of waking up at midnight or early in the morning, having to get up to take a shower, inability to breathe easily, coughing or snoring, feeling too cold, feeling too hot, having nightmares, pain and other reasons. Use of sleep medication, questions how often they use hypnotics in the last month. Day time dysfunction, questions the lack of enthusiasm to carry out daily function and having difficulty to stay awake while driving, eating meals or engaging in social activity).

### Preparation of the questionnaire sheet for data collection

Valid and reliable A-YIAT and A-PSQI were used.

### Validity: (Face, content validity)

Was done for the added part of the questionnaire which included socio demographic, internet use and lifestyle data via 3 experts in Public Health and Community Medicine and they recommend slight changes in paraphrasing.

Pre-test study was carried out before starting data collection during the period from start of September 2020 to end of December 2020 with the following objectives: [To test and evaluate the suitability of the questionnaire, to estimate the time needed for filling the questionnaire, to explore the potential obstacles that might be met with during the execution of the study, the questionnaire revealed that the items were suitable and easy to be filled by researcher, the time needed to fulfill each questionnaire ranged from 10-15 minutes and the pre-test responses were not included in the final analysis].

### Sample Size Calculation

Sample size was calculated using Mini Tab statistical program version 16, software statistical package. The minimal sample size for one proportion (sleep disorders) was found to be 1269 putting in consideration that hypothesized probability was 45%, alternative probability 40% and alpha error 5%<sup>[22]</sup>. The response rate was found to be 100% and the power of the study was 100% putting into consideration that hypothesized sleep disorder was 45%, sample size 1269 and outcome of sleep disorder was 60%.

### Statistical analysis

Statistical analysis was done by SPSS v26 (IBM Inc., Chicago, IL, USA). Quantitative variables were presented as mean and standard deviation (SD) and compared between

the three groups utilizing ANOVA (F) test with post hoc test (Tukey). Qualitative variables were presented as frequency and percentage (%) and were analyzed utilizing the Chi-square test. Univariate regression was used to estimate the relationship between a dependent variable and one independent variable. A two tailed P value < 0.05 was considered statistically significant.

**Results**

Age, sex, father and mother education and occupation, family income, academic score, BMI, aim of internet, SIM card, access of the internet and sleep quality categories showed a significantly difference between two groups (p<0.05). Duration of internet use showed non significantly difference between two groups. Table 1.

**Table 1:** Distribution of socio-demographic characteristics, internet use data and sleep quality categories according to residence of the pupils

Age (Years)		Urban (n=444)	Rural (n=825)	P
Sex	Male	15.87±.83	16.02±.91	0.01*
	Female	177 (39.9%)	397 (48.1%)	0.01*
Father education	Illiterate	267 (60.1%)	428 (51.9%)	0.00*
	Read and write	1 (0.2%)	19 (2.3%)	
	Secondary	50 (11.3%)	130 (15.8%)	
	University	90 (20.3%)	243 (29.5%)	
	Postgraduate	209 (47.1%)	371 (44.9%)	
Mother education	Illiterate	94 (21.2%)	62 (7.5%)	0.00*
	Read and write	8 (1.8%)	44 (5.3%)	
	Secondary	50 (11.3%)	135 (16.4%)	
	University	87 (19.6%)	286 (34.7%)	
	Postgraduate	199 (44.8%)	286 (34.7%)	
Father occupation	Professional	100 (22.5%)	74 (9.0%)	0.00*
	Skilled	297 (66.9%)	441 (53.5%)	
	Unskilled	80 (18.0%)	220 (26.7%)	
	Employee	5 (1.1%)	14 (1.7%)	
	Not working	48 (10.8%)	126 (15.3%)	
Mother occupation	Professional	14 (3.2%)	24 (2.9%)	0.00*
	Skilled	297 (66.9%)	441 (53.5%)	
	Unskilled	80 (18.0%)	220 (26.7%)	
	Employee	5 (1.1%)	14 (1.7%)	
	Housewife	48 (10.8%)	126 (15.3%)	
Family income	Enough	211 (47.5%)	422 (51.2%)	0.00*
	Not enough	216 (48.6%)	572 (69.3%)	
	Enough and save	59 (13.3%)	119 (14.4%)	
		169 (38.1%)	134 (16.2%)	
Academic score	Low	145 (32.7%)	264 (32.0%)	0.04*
	Middle	222 (50.0%)	457 (55.4%)	
	High	77 (17.3%)	104 (12.6%)	
BMI (kg/m <sup>2</sup> )	Under weight	29 (6.5%)	3 (0.4%)	0.00*
	Normal	293 (66.0%)	561 (68.0%)	
	Overweight	110 (24.8%)	227 (27.5%)	
	Obese	12 (2.7%)	34 (4.1%)	
Aim of internet use	Enjoying	238 (53.6%)	500 (60.6%)	0.05*
	Educational communication	130 (29.3%)	219 (26.6%)	
		76 (17.1%)	106 (12.8%)	
SIM card	1	256 (57.7%)	567 (68.7%)	0.001*
	2	116 (26.1%)	155 (18.8%)	
	3	47 (10.6%)	69 (8.4%)	
	4	25 (5.6%)	34 (4.1%)	
Duration of internet use (hours/day)	<3	162 (36.5%)	280 (33.9%)	0.162
	3-10	278 (62.6%)	543 (65.9%)	
	>10	4 (0.9%)	2 (0.2%)	
Internet access	Outside home	133 (30.0%)	306 (37.1%)	0.014*
	At home	311 (70.0%)	519 (62.9%)	
Sleep quality categories	Good sleepers	157 (35.4%)	350 (42.4%)	0.014*
	Poor sleepers	287 (64.6%)	475 (57.6%)	

Data are presented as mean ± SD or frequency (%). \*Significant p value<0.05, BMI: Body mass index, SIM: subscriber identity module

The internet more time that they intended, ignoring domestic duties due to the internet, preferred the excitement of the internet on their relations with friends or colleagues, their parents occasionally complained of time they spent on the internet, their social life was occasionally affected by time spent on the internet, academic score was rarely affected by internet, hiding annoying thoughts by soothing thoughts of the internet, getting upset from life without the internet, screaming when others annoyed them during internet usage, pupils were rarely dreaming with the internet when they were not, occasionally saying just minutes when

they use the internet and someone interrupted them, rarely concealing their duration of internet use, occasionally preferred spending more time on the internet than sitting with others and occasionally felt depressed when they were not connected to the internet showed a significantly difference between two groups (p<0.05). Established new relationships with followers on the internet, examining their email before anything, expecting internet connection again, pupils rarely lost sleep due to internet use at late time and occasionally trying to end the time they spent on the internet, but they failed showed a non-significantly

difference between two groups. Table 2.

**Table 2:** Distribution of IA test according to residence of the pupils

		Urban (n=444)	Rural (n=825)	P
Do you stay on internet more time that you intended?	Rarely	77 (17.3%)	215 (26.1%)	0.00*
	Occasionally	145 (32.7%)	278 (33.7%)	
	Frequently	90 (20.3%)	185 (22.4%)	
	Often	67 (15.1%)	96 (11.6%)	
	Always	65 (14.6%)	51 (6.2%)	
Do you ignore domestic duties due to internet?	Rarely	136 (30.6%)	213 (25.8%)	0.031*
	Occasionally	138 (31.1%)	304 (36.8%)	
	Frequently	85 (19.1%)	176 (21.3%)	
	Often	63 (14.2%)	83 (10.1%)	
	Always	22 (5.0%)	49 (5.9%)	
Do you prefer the excitement of the internet on intimacy to your friend?	Rarely	112 (25.2%)	243 (29.5%)	0.00*
	Occasionally	163 (36.7%)	218 (26.4%)	
	Frequently	93 (20.9%)	177 (21.5%)	
	Often	34 (7.7%)	114 (13.8%)	
	Always	42 (9.5%)	73 (8.8%)	
Do you form new relationship with followers on internet?	Rarely	150 (33.8%)	268 (32.5%)	0.477
	Occasionally	113 (25.5%)	184 (22.3%)	
	Frequently	74 (16.7%)	166 (20.1%)	
	Often	72 (16.2%)	134 (16.2%)	
	Always	35 (7.9%)	73 (8.8%)	
Do your parents complain of time you spend on internet?	Rarely	103 (23.2%)	190 (23.0%)	0.00*
	Occasionally	133 (30.0%)	312 (37.8%)	
	Frequently	88 (19.8%)	189 (22.9%)	
	Often	60 (13.5%)	75 (9.1%)	
	Always	60 (13.5%)	59 (7.2%)	
Does your social life affected by time you spend on internet?	Rarely	173 (39.0%)	254 (30.8%)	0.016*
	Occasionally	147 (33.1%)	298 (36.1%)	
	Frequently	59 (13.3%)	157 (19.0%)	
	Often	45 (10.1%)	82 (9.9%)	
	Always	20 (4.5%)	34 (4.1%)	
Do you examine your email before anything?	Rarely	168 (37.8%)	275 (33.3%)	0.06
	Occasionally	88 (19.8%)	190 (23.0%)	
	Frequently	91 (20.5%)	152 (18.4%)	
	Often	52 (11.7%)	136 (16.5%)	
	Always	45 (10.1%)	72 (8.7%)	
Does your score affect by internet?	Rarely	178 (40.1%)	265 (32.1%)	0.00*
	Occasionally	135 (30.4%)	297 (36.0%)	
	Frequently	64 (14.4%)	177 (21.5%)	
	Often	41 (9.2%)	51 (6.2%)	
	Always	26 (5.9%)	35 (4.2%)	
Do you become defensive when other asks what you do on internet?	Rarely	172 (38.7%)	202 (24.5%)	0.00*
	Occasionally	100 (22.5%)	244 (29.6%)	
	Frequently	75 (16.9%)	218 (26.4%)	
	Often	68 (15.3%)	102 (12.4%)	
	Always	29 (6.5%)	59 (7.2%)	
Do you hide annoying thoughts by soothing thoughts of internet?	Rarely	93 (20.9%)	195 (23.7%)	0.00*
	Occasionally	143 (32.2%)	304 (36.8%)	
	Frequently	97 (21.8%)	209 (25.3%)	
	Often	68 (15.3%)	67 (8.1%)	
	Always	43 (9.7%)	50 (6.1%)	
Do you expect your internet connection again?	Rarely	123 (27.7%)	225 (27.3%)	0.8
	Occasionally	121 (27.3%)	242 (29.2%)	
	Frequently	90 (20.3%)	172 (20.9%)	
	Often	75 (16.9%)	134 (16.3%)	
	Always	35 (7.9%)	52 (6.3%)	
Do you get upset from life without internet?	Rarely	82 (18.5%)	158 (19.2%)	0.00*
	Occasionally	125 (28.2%)	256 (31.0%)	
	Frequently	83 (18.7%)	229 (27.7%)	
	Often	68 (15.3%)	95 (11.5%)	
	Always	86 (19.4%)	87 (10.6%)	
Do you scream when other annoyed you during internet use?	Rarely	168 (37.8%)	221 (26.8%)	0.00*
	Occasionally	90 (20.3%)	239 (29.0%)	
	Frequently	91 (20.5%)	251 (30.4%)	
	Often	40 (9.0%)	66 (8.0%)	
	Always	55 (12.4%)	48 (5.8%)	
Do you lose sleep due to internet use at late time?	Rarely	120 (27.0%)	248 (30.1%)	0.077
	Occasionally	118 (26.6%)	228 (27.6%)	

	Frequently	83 (18.7%)	167 (20.2%)	
	Often	71 (16.0%)	123 (14.9%)	
	Always	52 (11.7%)	59 (7.2%)	
Do you dream with internet when you are not connected?	Rarely	165 (37.2%)	209 (25.3%)	0.00*
	Occasionally	113 (25.5%)	277 (33.6%)	
	Frequently	83 (18.7%)	211 (25.6%)	
	Often	52 (11.7%)	90 (10.9%)	
	Always	31 (7.0%)	38 (4.6%)	
Do you say just few minutes when you use the internet?	Rarely	87 (19.6%)	162 (19.5%)	0.00*
	Occasionally	120 (27.0%)	276 (33.5%)	
	Frequently	105 (23.6%)	156 (18.9%)	
	Often	56 (12.6%)	143 (17.4%)	
	Always	76 (17.1%)	88 (10.7%)	
Do you try to end time you spend on internet, and you fail?	Rarely	119 (26.8%)	198 (24.0%)	0.37
	Occasionally	125 (28.2%)	257 (31.2%)	
	Frequently	85 (18.9%)	181 (21.9%)	
	Often	70 (15.8%)	114 (13.8%)	
	Always	46 (10.4%)	75 (9.1%)	
Do you conceal duration on internet?	Rarely	164 (36.9%)	254 (30.8%)	0.00*
	Occasionally	78 (17.6%)	216 (26.1%)	
	Frequently	89 (20.0%)	178 (21.6%)	
	Often	47 (10.6%)	114 (13.6%)	
	Always	66 (14.9%)	63 (7.6%)	
Do you prefer to spend more time on internet than sitting with others?	Rarely	103 (23.2%)	210 (25.5%)	0.001*
	Occasionally	103 (23.2%)	244 (29.5%)	
	Frequently	111 (25.0%)	195 (23.7%)	
	Often	53 (11.9%)	99 (12.0%)	
	Always	74 (16.7%)	77 (9.3%)	
Do you feel depressed when you are not connected to internet?	Rarely	139 (31.3%)	228 (27.6%)	0.015**I**
	Occasionally	132 (29.7%)	273 (33.1%)	
	Frequently	89 (20.0%)	211 (25.6%)	
	Often	35 (7.9%)	56 (6.8%)	
	Always	49 (11.0%)	57 (6.9%)	

Data are presented as frequency (%). \*Significant p value<0.05, IA: internet addiction

The age, sex, father and mother education and occupation, family income, academic score, pupils who were using the internet for enjoying, educational and connection, SIM card, duration of internet use, access of internet, drinking tea or coffee, watching TV, using mobile before sleep, hobbies,

hypnotics, smoking, and parental monitoring showed a significantly relationship between them and IA categories ( $p<0.05$ ). Residence showed non-significant relationship between them and IA categories. Table 3.

**Table 3:** Relationships between socio demographic characteristics, internet use data and lifestyle data and IA categories of the pupils

Age (Years)		Little or no (n=648)	Moderate (n=603)	Sever (n=18)	P
		16.02±.92	15.91±.84	15.83±.7	0.02*
Sex	Male	273 (47.6%)	295 (51.4%)	6 (1.0%)	0.03*
	Female	375 (54.0%)	308 (44.3%)	12 (1.7%)	
Residence	Rural	439 (53.2%)	373 (45.2%)	13 (1.6%)	0.07*
	Urban	209 (47.1%)	230 (51.8%)	5 (1.1%)	
Father education	Illiterate	7 (35.0%)	13 (65.0%)	0 (0.0%)	0.04*
	Read and write	78 (43.3%)	98 (54.4%)	4 (2.2%)	
	Secondary	191 (57.4%)	137 (41.1%)	5 (1.5%)	
	University	298 (51.4%)	277 (47.8%)	5 (0.9%)	
	Postgraduate	74 (47.4%)	78 (50.0%)	4 (2.6%)	
Mother education	Illiterate	21 (40.4%)	31 (59.6%)	0 (0.0%)	0.00*
	Read and write	95 (51.4%)	83 (44.9%)	7 (3.8%)	
	Secondary	213 (57.1%)	154 (41.3%)	6 (1.3%)	
	University	248 (51.1%)	233 (48.0%)	4 (0.8%)	
	Postgraduate	71 (40.8%)	102 (58.6%)	1 (0.6%)	
Father occupation	Professional	370 (50.1%)	360 (48.8%)	8 (1.1%)	0.02*
	Skilled	137 (45.7%)	159 (53.0%)	4 (1.3%)	
	Unskilled	12 (63.2%)	7 (36.8%)	0 (0.0%)	
	Employee	106 (60.9%)	62 (35.6%)	6 (3.4%)	
	Not working	23 (60.5%)	15 (39.5%)	0 (0.0%)	
Mother occupation	Professional	209 (50.0%)	207 (49.5%)	2 (0.5%)	0.00*
	Skilled	27 (60.0%)	18 (40.0%)	0 (0.0%)	
	Unskilled	9 (30.0%)	21 (70.0%)	0 (0.0%)	
	Employee	62 (43.4%)	79 (55.2%)	2 (1.4%)	
	Housewife	341 (53.9%)	278 (43.9%)	14 (2.2%)	
Family income	Enough	461 (58.5%)	320 (40.6%)	7 (0.9%)	0.00*
	Not enough	61 (34.3%)	114 (64.0%)	3 (1.7%)	

	Enough and save	126 (41.6%)	169 (55.8%)	8 (2.6%)	
Academic score	Low	177 (43.3%)	226 (55.3%)	6 (1.5%)	0.04*
	Middle	379 (55.8%)	291 (42.9%)	9 (1.3%)	
	High	92 (50.8%)	86 (47.5%)	3 (1.7%)	
BMI (kg/m <sup>2</sup> )	Under weight	16 (50.0%)	16 (50.0%)	0 (0.0%)	0.00*
	Normal	432 (50.6%)	409 (47.9%)	13 (1.5%)	
	Overweight	172 (51.0%)	160 (24.5%)	5 (1.5%)	
	Obese	28 (60.9%)	18 (39.1%)	0 (0.0%)	
Aim of internet use	Enjoying	313 (42.4%)	410 (55.4%)	16 (2.2%)	0.05*
	Educational	243 (69.6%)	106 (30.4%)	0 (0.0%)	
	communication	92 (50.8%)	87 (48.1%)	2 (1.1%)	
SIM card	1	517 (62.8%)	517 (62.8%)	12 (1.5%)	0.001*
	2	86 (31.7%)	86 (31.7%)	4 (1.5%)	
	3	28 (24.1%)	28 (24.1%)	1 (0.9%)	
	4	17 (28.8%)	17 (28.8%)	1 (1.7%)	
Duration of internet use (Hours/day)	<3	316 (71.5%)	126 (28.5%)	0 (0.0%)	0.162
	3-10	331 (40.3%)	473 (57.6%)	17 (2.1%)	
	>10	1 (16.7%)	4 (66.6%)	1 (16.7%)	
Internet access	Outside home	283 (64.5%)	153 (34.8%)	3 (0.7%)	0.014*
	At home	365 (44.0%)	450 (54.2%)	15 (1.8%)	
Lifestyle data	Drinking tea or coffee	366 (44.0%)	450 (54.2%)	15 (1.8%)	0.00*
	Watching TV	574 (54.1%)	473 (44.6%)	14 (1.3%)	
	Mobile use before sleep	541 (48.9%)	548 (49.5%)	18 (1.6%)	
	Having hobbies	366 (52.3%)	320 (45.6%)	15 (2.1%)	
	Using hypnotics	7 (15.9%)	36 (81.8%)	1 (2.3%)	
	Smoking	8 (18.2%)	35 (79.5%)	1 (2.3%)	
	Parental monitoring	425 (62.1%)	259 (37.9%)	0 (0.0%)	

Data are presented as mean ± SD or frequency (%). \*Significant p value<0.05, BMI: Body mass index, SIM: subscriber identity module, IA: internet addiction

Distribution of sleep difficulties among studied pupils according to residence during the last month, cannot sleep within 30 minutes, get up at midnight or at morning, get up due to going to bathroom, cannot breathe easily, feel too hot, have bad dreams and feel pain showed a significantly

difference between both groups (p<0.05). Have sleep problems due to cough, feel too cold and have other reasons of poor sleep showed non-significant difference between both groups. Table 4.

**Table 4:** Distribution of sleep difficulties among the studied pupils according to residence during the last month

		Urban (n=444)	Rural (n=825)	P
Cannot sleep within 30 minutes	Not during the last month	231 (52.0%)	377 (45.7%)	0.00*
	Less than once a week	84 (18.9%)	264 (32.0%)	
	Once or twice a week	79 (17.8%)	124 (15.0%)	
	Three or more times a week	50 (11.3%)	60 (7.3%)	
Get up at midnight or at morning	Not during the last month	55 (12.4%)	239 (29.0%)	0.00*
	Less than once a week	151 (34.0%)	286 (34.7%)	
	Once or twice a week	136 (30.6%)	194 (23.5%)	
	Three or more times a week	102 (23.0%)	106 (12.8%)	
Get up due to going to bathroom	Not during the last month	65 (14.6%)	288 (34.9%)	0.00*
	Less than once a week	149 (33.6%)	247 (29.9%)	
	Once or twice a week	136 (30.6%)	171 (20.7%)	
	Three or more times a week	94 (21.2%)	119 (14.4%)	
Cannot breathe easily	Not during the last month	231 (52.0%)	497 (60.2%)	0.003*
	Less than once a week	100 (22.5%)	166 (20.1%)	
	Once or twice a week	52 (11.7%)	97 (11.8%)	
	Three or more times a week	61 (13.7%)	65 (7.9%)	
Have sleep problems due to cough	Not during the last month	297 (66.9%)	562 (68.1%)	0.823
	Less than once a week	61 (13.7%)	103 (12.5%)	
	Once or twice a week	52 (11.7%)	104 (12.6%)	
	Three or more times a week	34 (7.7%)	56 (6.8%)	
Feel too cold	Not during the last month	203 (45.7%)	428 (51.9%)	0.074
	Less than once a week	97 (21.8%)	184 (22.3%)	
	Once or twice a week	85 (19.1%)	131 (15.9%)	
	Three or more times a week	59 (13.3%)	82 (9.9%)	
Feel too hot	Not during the last month	154 (34.7%)	350 (42.4%)	0.001*
	Less than once a week	98 (22.1%)	145 (17.6%)	
	Once or twice a week	110 (24.8%)	144 (17.5%)	
	Three or more times a week	82 (18.5%)	186 (22.5%)	
Have bad dreams	Not during the last month	140 (31.5%)	371 (45.0%)	0.00*
	Less than once a week	130 (29.3%)	180 (21.8%)	
	Once or twice a week	103 (23.2%)	153 (18.5%)	
	Three or more times a week	71 (16.0%)	121 (14.7%)	

Feel pain	Not during the last month	175 (39.4%)	557 (67.5%)	0.00*
	Less than once a week	96 (21.6%)	121 (14.7%)	
	Once or twice a week	92 (20.7%)	74 (9.0%)	
	Three or more times a week	81 (18.2%)	73 (8.8%)	
Have other reasons of poor sleep	Not during the last month	312 (70.3%)	612 (74.2%)	0.45
	Less than once a week	42 (9.5%)	67 (8.1%)	
	Once or twice a week	39 (8.8%)	69 (8.4%)	
	Three or more times a week	51 (11.5%)	77 (9.3%)	

Data are presented as frequency (%). \*Significant p value<0.05

Distribution of internet addiction categories according to residence of the pupils. It showed that about half (51.1%) of pupils were little or no addicts and the remaining half (47.5% and 1.4%) were moderate and sever internet addicts respectively. In rural areas, 53.2%, 45.2% and 1.6% of pupils were little or no, moderate and sever internet addicts

respectively while 47.1%, 51.8% and 1.1% of pupils living in urban area were little or no, moderate and sever internet addicts respectively without significant difference in internet addiction categories according to residence with chi square test was 5.18 and p value was 0.075. Figure 1.

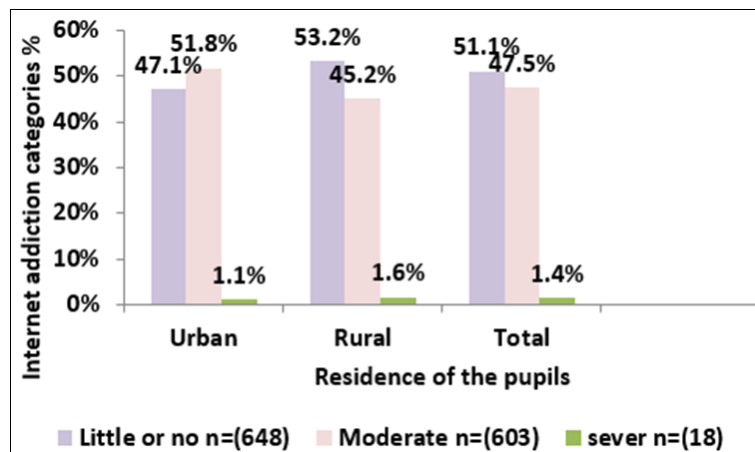


Fig 1: Distribution of internet addiction categories according to residence of the pupils

The father occupation, BMI, smoking, and hobbies showed non-significant relationship between them and sleep quality categories. Residence, mother and father education, mother occupation, family income, academic score, drinking coffee or tea, watching TV, using drugs for sleep, parental

monitoring, aim of internet use, SIM card, duration of internet use and access of internet use showed a significantly relationship between them and sleep quality categories (p<0.05%). Table 5.

Table 5: Relationships between socio-demographic characteristics and lifestyle and sleep quality categories of the pupils

		Good sleepers (n=507)	Poor sleepers (n=762)	P
Father education	Illiterate	7 (35.0%)	13 (65.0%)	0.00*
	Read and write	76 (42.2%)	104 (57.8%)	
	Secondary	159 (47.7%)	174 (52.3%)	
	University	217 (37.4%)	363 (62.6%)	
	Postgraduate	48 (30.8%)	108 (69.2%)	
Mother education	Illiterate	21 (40.4%)	31 (59.6%)	0.00*
	Read and write	92 (49.7%)	93 (50.3%)	
	Secondary	172 (46.1%)	201 (53.9%)	
	University	174 (35.9%)	311 (64.1%)	
	Postgraduate	48 (27.6%)	126 (72.4%)	
Father occupation	Professional	277 (37.5%)	461 (62.5%)	0.07
	Skilled	120 (40.0%)	180 (60.0%)	
	Unskilled	8 (42.1%)	11 (57.9%)	
	Employee	86 (49.4%)	88 (50.6%)	
	Not working	16 (42.1%)	22 (57.9%)	
Mother occupation	Professional	145 (34.7%)	273 (65.3%)	0.00*
	Skilled	22 (48.9%)	23 (51.1%)	
	Unskilled	3 (10.0%)	27 (90.0%)	
	Employee	57 (39.9%)	86 (60.1%)	
	Not working	280 (44.2%)	353 (55.8%)	
Family income	Enough	352 (44.7%)	436 (55.3%)	0.00*
	Not enough	60 (33.7%)	118 (66.3%)	
	Enough and save	95 (31.4%)	208 (68.6%)	
Academic score	Low	139 (34.0%)	270 (66.0%)	0.01*
	Middle	289 (42.6%)	390 (57.4%)	
	High	79 (43.6%)	102 (56.4%)	

BMI	Under weight	12 (37.5%)	20 (62.5%)	0.84
	Normal	335 (39.2%)	519 (60.8%)	
	Overweight	141 (41.8%)	196 (58.2%)	
	Obese	19 (41.3%)	27 (58.7%)	
Lifestyle data	Smoking	14 (31.8%)	30 (68.2%)	0.26
	Drink tea or coffee	294 (35.4%)	537 (64.6%)	0.00*
	Watching TV	450 (42.3%)	612 (57.7%)	0.000*
	Using mobile before sleep	421 (38.1%)	687 (61.9%)	0.001*
	Hobbies	292 (41.7%)	409 (58.3%)	0.2
	Using drugs for sleep	4 (9.1%)	40 (90.9%)	0.00*
	Parental monitoring	336 (49.1%)	348 (50.9%)	0.000*

Data are presented as mean ± SD or frequency (%). \*Significant p value<0.05, BMI: Body mass index, SIM: subscriber identity module

The aim of internet use, SIM card, duration of internet use and access of internet use showed a significantly

relationship between them and sleep quality categories ( $p<0.05$ ). Figure 2.

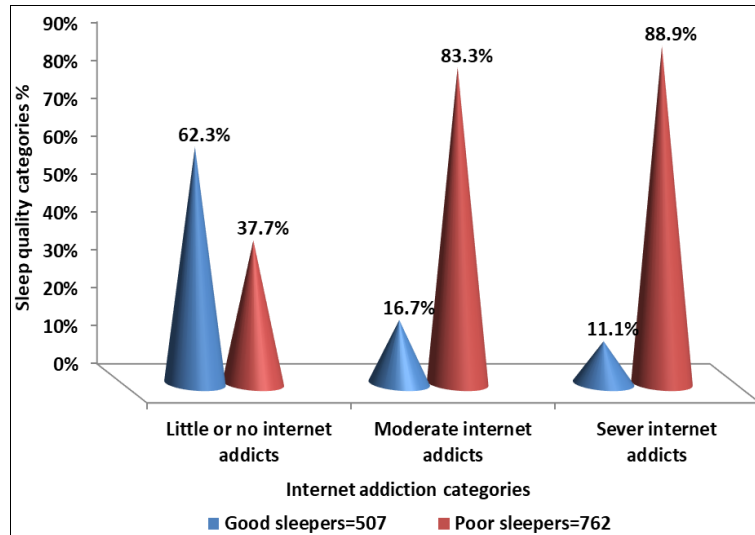


Fig 2: Relationship between sleep quality and internet addiction categories of the pupils

Duration of internet use, SIM card number, drinking tea or coffee, family monitoring, aim of internet use, age, watching TV, using hypnotics, using mobile before sleep, family income and smoking were considered significant predictors of IA with effect of 33.6%. The excluded variables were sex, residence, father and mother educational level and occupation, BMI, academic score in the previous year, having hobbies and access of internet. Predictors of sleep quality using stepwise linear regression analysis. It revealed that IA level, duration of internet use, aim of

internet use, mother educational level, family monitoring, aim of internet use, access of the internet, using hypnotics, watching TV, smoking, and mothers' occupation were considered significant predictors of sleep quality with effect of 36.7%. The excluded variables were age, sex, residence, father educational level and occupation, BMI, academic score in the previous year, drinking tea or coffee, SIM card number, using mobile before sleep, having hobbies and family income. Table 6

Table 6: Predictors of IA and sleep quality using stepwise linear regression analysis

	Un standardized coefficient		Standardized coefficient	P
	B	St. Error	Beta	
Constant	3.362	.840		0.000*
IA level	2.563	.161	.400	0.000*
Using hypnotics	2.932	.423	.159	0.000*
Duration of internet use	.718	.175	.103	0.000*
Family monitoring	.891	.174	.132	0.000*
Mother education	.218	.092	.066	0.018*
Access of internet	.552	.160	.080	0.001*
Aim of internet use	.269	.094	.07	0.004*
Watching TV	.448	.199	.052	0.024*
Smoking	.934	.422	.051	0.027*
Mother occupation	.113	.052	.061	0.029*
<b>Internet addiction</b>				
Constant	28.968	7.733		0.000*
Duration of internet use	8.521	.813	.266	0.000*
SIM card number	4.614	.461	.250	0.000*
Drinking tea, coffee	6.250	.747	.198	0.000*
Family monitoring	4.308	.808	.139	0.000*
Aim of internet use	2.247	.444	.126	0.000*



Age	2.126	.409	.121	0.000*
Watching TV	4.260	.927	.107	0.000*
Using hypnotics	8.353	1.999	.098	0.000*
Using mobile before sleep	4.395	1.084	.097	0.000*
Family income	1.824	.626	.071	0.004*
Smoking	4.772	1.987	.056	0.016*

\*Significant p value<0.05, SIM: subscriber identity module, IA: Internet Addiction

## Discussion

PIU is an emerging epidemic worldwide and many studies have reported alarming numbers of internet addicts. Sleep disorders is one of the negative effects of PIU. As sleep is a must for physical and mental health and is life supporting event, it is essential to discover the relationship between PIU and sleep quality among adolescents<sup>[23]</sup>.

The present results showed that more than half of pupils who were using the internet for entertainment were moderate internet addicts while seventy percent of those who were using the internet for educational purposes were little or no addicts with significant relationship between aim of internet use and IA categories. In contrast a study conducted by Balhara *et al.*<sup>[24]</sup> found that no relationship between purpose of internet use and PIU.

Regarding duration spent on the internet, the present study found that more than two thirds of pupils who were using the internet for more than 10 hours/day were moderate internet addicts and more than half of those who were using the internet from 3 to 10 hours/day were moderate internet addicts compared to majority of those who were using the internet for less than 3 hours/day were little or no users with significant relationship between duration of internet use and IA categories. This was like a study conducted by El Deeb *et al.*<sup>[25]</sup> reported a significant between duration of internet use and IA and showed that more than two thirds of students who use the internet from three to ten hours per day were internet.

Three quarters of those who had 3 SIM card were moderate internet addicts while more than half of those who had one SIM card were little or no internet addicts with significant relationship between number of SIM card and IA as increase the number of SIM will increase the duration of internet use. Our study found that more than half of those who were using the internet through domestic connection were significantly moderate internet addicts while more than three fifths of those who were using the internet outside home were significantly little or no internet addicts. This is close to a study conducted by Adhikar *et al.*<sup>[26]</sup> showed that students who had internet access at home were significantly two times more addicted to the internet than those who didn't have. The present results showed that risk factors of PIU were young age, male sex, parents' occupation and high educational level, high family income, low academic score, non-educational aims of internet use, domestic internet access and increased duration of internet use, number of SIM card, smoking, watching TV, drinking tea or coffee, using mobile before sleep, not having hobbies, using sleep medication and lack of parental monitoring. The current study revealed that duration of internet use, SIM card number, drinking tea or coffee, family monitoring, aim of internet use, age, using drugs for sleep, watching TV, using mobile before sleep, family income and smoking were considered significant predictors of IA with the effect of 33.6%. This is supported by Salama *et al.*<sup>[27]</sup> reported that age, internet use for entertainment, duration of internet use more than 4h per day and smoking were risk factors for PIU.

The present study revealed that three fifths of students were suffering from poor sleep quality according to PSQI. This

was consistent with Kocas, and Tayyar<sup>[28]</sup> reported that 58.6% had poor sleep quality.

The present study showed statistically significant relationship between IA and sleep quality among students. majority of moderate internet addicts were poor sleepers and most of severe addicts were poor sleepers. This agreed with a study in Egypt conducted by Mahmoud *et al.*<sup>[29]</sup> revealed that 81.6% of students who suffer from IA significantly had poor sleep quality.

Reduced sleep hours and poor sleep quality result from excessive use of the internet lead to daytime sleepiness in the students. This in turn reduces cognitive, social, psychological, and physical performance in internet addict persons<sup>[30]</sup>. In contrast a study conducted by Awasthi, Taneja *et al.*<sup>[31]</sup> found no significant correlation between PSQI scores with internet addiction. Regards residence more than half of pupils from rural areas were significantly poor sleepers compared to 64.6% of urban pupils. Similarly, a multinational survey in seven countries conducted by Tahir *et al.*<sup>[32]</sup> revealed that the participants living in urban residence had poorer sleep than those living in rural areas.

The current study found that about two thirds of those who achieved low score were poor sleepers and there was significant relationship between academic score and sleep quality categories. Reduced sleep hours and poor sleep quality result from excessive use of the internet lead to daytime sleepiness in the students. This in turn reduces cognitive, social, psychological, physical performance and academic achievement in internet addict persons<sup>[30, 33]</sup>. Similarly, a study conducted by Elsheikh *et al.*<sup>[34]</sup> and Elbilgahy *et al.*<sup>[35]</sup> found association between poor sleep quality and academic performance.

Our results found that there was none significant relationship between height, weight, BMI from one side and sleep quality categories from the other side. Similarly, a study conducted by Acikgoz *et al.*<sup>[36]</sup> found no significant association between BMI and sleep quality in adolescents.

The present study found that more than three fifths of students who were using mobile before sleep were significantly poor sleepers. This is like studies conducted by Alshobaili and AlYousefi<sup>[37]</sup> and El-Sheikh *et al.*<sup>[34]</sup> reported negative impact of using smart phone at bedtime on sleep quantity and quality.

The present study found that more three quarters of pupils who were significantly not undergoing parental monitoring were poor sleepers while about half of those who were undergoing parental monitoring were significantly good sleepers. This is consistent with a study conducted by Roblyer and Grzywacz<sup>[38]</sup> found a negative association between parental monitoring and sleep difficulties as parents inclined to monitor their children's behavior were more probably to support sleep hygiene as rationalize the use of electronic devices and controlling the physical environment of the home.

Our study found that two thirds of students who were drinking tea or coffee were significantly poor sleepers. This is because of caffeinated drinks help for restoring walkfulness, modulating brain activity and improving task performance<sup>[39]</sup>. This is consistent with Elsheikh *et al.*<sup>[34]</sup> revealed association between caffeinated drinks and sleep

quality.

Our results revealed that more than half of pupils who were watching TV were significantly poor sleepers. As televisions emit the blue light that may disrupt the natural circadian rhythm which contributes to poor sleep quality. This is close to a study conducted by Kocas and Tayyar<sup>[28]</sup> found a significant association between watching TV and poor sleep quality.

The present study found that more than two thirds of pupils who were using the internet for enjoying were poor sleepers while more than half of those who were using the internet for educational purposes were good sleepers with significant relationship between aim of internet use and sleep quality categories. This was like a study conducted by Kocas and Tayyar<sup>[28]</sup> found significant association between non-educational purposes of internet use and poor sleep quality. Our results revealed that most pupils who were using the internet more than 10 hours/ day were poor sleepers and more than two thirds of those who were using the internet from 3 to 10 hours/day were poor sleepers with significant relationship between duration of internet use and sleep quality categories. As time spent on the internet hinder the process of preparation for sleep and light and noise from electronic devices suppress melatonin secretion the sleep hormone which was delay sleep and disrupts sleep quality. Similarly, Cellini *et al.*<sup>[40]</sup> found that spending ample time on internet was associated with bad sleep quality, anxiety and depression. The current study revealed that about two thirds of pupils who were using the internet through domestic connection were significantly poor sleepers.

Our study revealed that urban residence, high educational level of parents, professional mothers, high family income, low academic score, drinking tea or coffee, watching TV, using mobile before sleep, using hypnotics, lack of parental monitoring, non-educational purposes of internet use, domestic access and increased duration of internet use and number of SIM card were considered risk factors for poor sleep quality. Internet addiction, duration of internet use, aim of internet use, mother occupation and educational level, family monitoring, sleep medication, watching TV and smoking were found to be significant predictors for sleep quality with effect of 36.7%. This was like a study conducted by Tahir *et al.*<sup>[32]</sup> which that IA was a strong predictor for poor sleep quality.

Our study recommended that pupils should be early screening for IA using IAT for providing treatment early and preventing hazards to health. Providing an educational program for pupils on the healthy practice of the internet. Parental education about how to use technology to be able to guide and monitor their children. The hazards and determinants of internet technology should be added to the educational curricula and the methods that must be followed to avoid adverse effects of the internet. Centers for treatment of IA in our countries need to be established to help problematic internet users. Further in depth and root research about internet usage and associated risk factors of its problematic use in our Arabic countries are required to measure the extent of the problem.

### Conclusion

Half of the pupils were moderate and severe problematic internet users and sixty percent of the pupils were poor sleepers. Risk factors of PIU were young age, male gender, parents' occupation and high educational level, high family income, low academic score, non-educational aims of internet use, domestic internet access and increased duration of internet use, increased number of SIM card, smoking,

watching TV, drinking tea or coffee, using mobile before sleep, not having hobbies, using sleep medication and lack of parental monitoring. Duration of internet use, SIM card number, family monitoring, purpose of internet use, age, using drugs for sleep, watching TV, using mobile before sleep, family income drinking tea or coffee and smoking were strong predictors of PIU. There was significant relationship between PIU and sleep quality.

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