# Transition to Medical College: Dynamics of Depression, Internet Addiction and Nutritional Status among Junior Medical Students

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## ABSTRACT

**Background:** The initial years of a medical student's life can be challenging. Coping mechanisms with internet technology can have adverse health effects. This study assessed the depression, internet addiction and nutritional status among junior medical students.

**Materials and methods:** This cross-sectional study was conducted among first and third semester medical students of a new central institute in South India. Depression and internet addiction were assessed by Patient Health Questionnaire-9 and Young's Internet Addiction Test, respectively. Mann Whitney U test, Pearson's Chi-squared/Fishers Exact tests and Structural Equation Modelling (SEM) were applied.

**Results:** A total of 97 medical students were studied. This comprised 60 male and 37 female students. Mean (SD) age was 19.3 (1.87) years. Most (68%) students were from rural backgrounds. Depression was higher among first semester students (p=0.017), whereas internet addiction was higher among third semester students (p=0.002). Prevalence of underweight, overweight and obesity were 7.2%, 18.6% and 35%, respectively. Correlates of internet addiction were previous hostel stay (p=0.047), nutritional status (p=0.043) and social media use (p<0.000). SEM explained the relationship of semester, depression and duration of smart phone usage with internet addiction.

**Conclusion:** Depression and internet addiction was higher among first semester and third semester students, respectively. Nutritional problems were prevalent across semesters.

**Key words:** Medical students, internet addiction, depression, nutritional status, adolescent,

## BACKGROUND

Transition from school to medical college is a major life event. Most students move away from home for the first time and are faced with new challenges. It becomes difficult to maintain the academic-social life balance with tight schedules, increasing workload, communication problems and adjustment issues.[1] Coping strategies by students in the age of modern technology include mobile phone and internet usage. However, unregulated and excessive use progresses to technology addictions.[2] Internet addiction among medical students is associated with poor academic performance, depression, malnutrition and in India, the prevalence of internet addiction ranges from 30% to 38.7%.[3,4] The dynamics of internet addiction and depression, compounded by irregular meal timings adversely affect nutritional status of medical students, which in turn has adverse health consequences.

Hence the present study was conducted to assess the correlates of depression, internet addiction and nutritional status among first and third semester medi-

cal students of a newly established medical institute in the country.

## MATERIALS AND METHODS

This cross-sectional study was conducted in a newly established autonomous central institute in South India. The first two batches of students were inducted in 2018 and 2019, comprising 50 students in each batch. The study population comprised all the students of the institute at the time of the study. The study was conducted after ethical clearance by the Institutional Ethics Committee (IEC clearance No. AIIMS/MG/IEC/2019-20/02).

Data collection was done between September and October 2019. Students were either in first semester or third semester during the study period. Students who consented to fill a pre-tested questionnaire after being explained about the study were part of the study. Students that did not use the internet for non-academic purposes and those who were on treatment for depression recently, were excluded. Questions covered information such on age, gender, hosteler or day-scholar, parental education and earning status (single/dual), number of siblings, previous stay in a hostel, distance from home, mode of travel (longest part of journey from home) and academic performance. The aggregate score of the recent terminal examination (board examination or first MBBS examination) were collected and normalized for further analysis. Mobile phone related questions included age of initiation, age of having a personal mobile phone, purpose of use (calling, social media, and gaming, listening to music, internet surfing for news or entertainment, academic work) and approximate duration of usage per day.

Depression was assessed by the Patient Health Questionnaire-9 (PHQ-9), which is a self-administered screening tool with nine questions. PHQ-9 scores of 5, 10, 15, and 20 can be further categorized to mild, moderate, moderately severe and severe depression respectively.[5]

Internet addiction was assessed by the validated Young's Internet Addiction Test which is a 20-item self-administered questionnaire. A total score of less than 20 represents normal/average online user, 20 to 49 represents mild addiction, a score 50 to 79 represents moderate addiction and a score of 80 to 100 indicates severe addiction.[6]

Weight and height were measured twice and the average considered, as per the standard anthropometry guidelines. Weight was measured to the nearest 100 grams on a digital weighing scale (Samso, personal weighing machine). Height was measured to the nearest 0.1 cm on a portable height scale (Stature meter, Damini Enterprises). Nutritional status was then estimated by the Body Mass Index (BMI) and expressed as kg/m². The Asian BMI cut-off levels were considered for categorizing nutritional status: underweight (< 18.5 kg/m2), normal BMI (18.5–22.9 kg/m2), overweight (23.0 –24.9 kg/m2) and obese (≥ 25 kg/m2).

## Statistical Analysis

Data analysis was done using Stata software version 14.2 (StataCorp, College Station, TX). Quantitative date was summarized as mean (standard deviation), median (inter-quartile range) as per normality (Shapiro Wilk Test). Categorical variables were presented as counts and percentages. Odds ratios were calculated for contingency tables and considered significant if 95% confidence intervals did not include the value 1. Pearson's Chi-squared test, Fisher's Exact Test and Mann Whitney U Test were applied for the bivariate analyses. Correlates were assessed by semester, prevalence of depression, internet addiction and malnutrition. Internet addiction score as continuous variable was analysed to find near significant associations with predictors. The confounders along with predictors were included in a structural equation model (SEM) and the path to addiction behaviour elucidated graphically. Modelling was carried out using IBM SPSS AMOS version 23.0. Standardized regression coefficients were used to link the variables. A relative chi-square (CMIN/DF) for minimum discrepancy was used to assess the resultant model. All p-values below 0.05 were treated as significant.

## RESULTS

A total of 97 students participated in the study. Two participants were excluded from the study and there was one refusal. About two-third of the students were males in both semesters. More than half (59.79%) of the students had stayed in a hostel prior to joining the institute. Most students in both semesters were from rural backgrounds. Parental education was mostly graduate level and above, with a significant difference in the maternal education between the two semesters (p = 0.034). Only ten students were single children (Table 1). Most (50.52%) of the students travelled by train to their hometowns. The other most common modes of transport were flight (21.65%) and bus (16.49%). Twelve students travelled by road (car/auto/bike).

Quantitative data are summarized in Table 2. Mean (SD) age of the students was 19.30 (1.87) years. There was no significant difference in the distance from home (p = 0.350) or hours of travel (p = 0.255) to hometown between two semesters. Mean normalized academic score for 12th standard of first semester students was 90.06 ± 8.65, whereas the same for first professional MBBS examination of third semester students was 90.05 ± 8.56.

### Depression

Of the total participants, 31(32%) students had mild depression (male = 20; female = 11). Eight (males = 6; females = 2) students had moderate depression; three students had moderately severe depression and one student (male) had severe depression.

**Table 1: Socio-demographic characteristics of the students by semester**

| Variable | Total (n = 97) (%) | Semester-I (n = 50) (%) | Semester-III (n = 47) (%) | p value |
|---|---|---|---|---|
| **Gender** | | | | |
| Male | 60 (61.86) | 31 (62.00) | 29 (61.70) | 0.976 |
| Female | 37 (38.14) | 19 (38.00) | 18 (38.30) | |
| **Current accommodation** | | | | |
| Hostel | 87 (89.69) | 45 (90.00) | 42 (89.36) | 1.000* |
| Day scholar | 10 (10.31) | 5 (10.00) | 5 (10.64) | |
| **Previous hostel stay** | | | | |
| Yes | 58 (59.79) | 26 (52.00) | 32 (68.09) | 0.106 |
| No | 39 (40.21) | 24 (48.00) | 15 (31.91) | |
| **Family Residence** | | | | |
| Urban | 66 (68.04) | 33 (66.00) | 33 (70.21) | 0.657 |
| Rural | 31 (31.96) | 17 (34.00) | 14 (29.79) | |
| **Father's education level** | | | | |
| No formal education/ Upto high school | 7 (7.22) | 5 (10.00) | 2 (4.26) | 0.550 |
| Secondary level/Diploma | 20 (20.62) | 10 (20.00) | 10 (21.28) | |
| Graduate and above | 70 (72.16) | 35(70.00) | 35 (74.47) | |
| **Mother's education level** | | | | |
| No formal education/ Upto high school | 18 (18.56) | 9 (18.00) | 9 (19.15) | **0.034†** |
| Secondary level/Diploma | 21 (21.65) | 16 (32.00) | 5 (10.64) | |
| Graduate and above | 58 (59.79) | 25 (50.00) | 33 (70.21) | |
| **Parental economic activity** | | | | |
| Dual Earner | 34 (35.05) | 16 (32.00) | 18 (38.30) | 0.516 |
| Single Earner | 63 (64.95) | 34 (68.00) | 29 (61.70) | |
| **Number of siblings** | | | | |
| One or more | 87 (89.69) | 44 (88.00) | 43 (91.49) | 0.742# |
| None | 10 (10.31) | 6 (12.00) | 4 (8.51) | |

*Fisher's Exact Test; †p < 0.05

**Table 2: Demographic profile and mobile phone usage pattern of the students by semester**

| Variable | Total (n = 97) | Semester-I (n = 50) | Semester-III (n = 47) | p value* |
|---|---|---|---|---|
| **Age (years)†** | 19.30 (1.87) | 18.92 (2.05) | 19.70 (1.57) | **0.005** |
| **Distance from home (km) ‡** | 900 (329,1550) | 800 (150,1480) | 1000 (346,1700) | 0.350 |
| **Hours of travel from home‡** | 7 (2.5,18) | 6.5 (2,17) | 7 (4,24) | 0.255 |
| **Previous hostel stay (years)‡** | 3 (2,4) | 3 (2,4) | 2 (2,4) | 0.261 |
| **Academic score†** | 78.43 (14.17) | 90.05 (8.65) | 66.07 (6.08) | **0.000** |
| **Age at mobile phone initiation (years)‡** | 16 (15,17) | 16 (15,18) | 16 (14,17) | 0.354 |
| **Age at mobile phone ownership (years)‡** | 17 (16,18) | 18 (17,18) | 17 (15,18) | **0.016** |
| **Usage per day (minutes)‡** | | | | |
| Calling (n = 96) | 60 (30,60) | 30 (30,60) | 60 (30,90) | 0.187 |
| Social media (n = 93) | 60 (30,120) | 60 (30,60) | 60 (30,180) | **0.001** |
| Gaming (n = 39) | 60 (30,60) | 30 (22.5,60) | 60 (30,90) | 0.217 |
| Music (n = 81) | 60 (30,120) | 60 (30,60) | 90 (60,120) | **0.002** |
| Internet surfing (n = 71) | 60 (30,60) | 45 (30,60) | 60 (30,90) | **0.013** |
| Academic (n = 85) | 60 (30,60) | 60 (30,60) | 60 (30,60) | 0.506 |

*Mann Whitney U Test †Mean (SD) ‡Median (IQR)

Males had a higher risk [odds ratio (OR) = 1.28 (95% CI = 0.55, 2.94)] of being depressed as compared to females and hostellers were 3.56 (95% CI = 0.71, 17.75) times more likely to be depressed. Depression was significantly more among first semester students as compared to third semester students (Table 3).

**Internet Addiction**

All students started using smartphones about the same age (p = 0.354) but the seniors (third semester) owned a phone significantly earlier (p = 0.016). The third semester students spent more time on social media (p = 0.001), music (p = 0.002) and internet surfing (p = 0.013) as compared to first semester students.

Mild internet addiction was present among 25 students. Five students had moderate level of internet addiction and one student (female) had severe internet addiction. Male students were 1.18 (95% CI 0.48-2.86) times more likely to be addicted. Third semester students were 4 times (95% CI = 1.59, 10.07) more susceptible to internet addiction than the first semester students (p = 0.002). Students who stayed longer (3.72 ± 2.30 years) in a hostel before joining the institute were more addicted to the internet than those with shorter duration (2.55 ± 1.76 years) of stay (p = 0.047).

**Table 3: Depression, internet addiction and malnutrition among the students by socio-demographic profile**

| Variable | Depression (%) | Chi square (p value)[1] | Internet addiction (%) | Chi square (p value)[2] | Malnutrition (%) | Chi square (p value)[3] |
|---|---|---|---|---|---|---|
| **Sex** | | | | | | |
| Male | 28 (65.12) | 0.348 | 20 (64.52) | 0.136 | 37 (62.71) | 0.046 |
| Female | 15 (34.88) | (0.555) | 11 (35.48) | (0.712) | 22 (37.29) | (0.829) |
| **Semester** | | | | | | |
| First | 28 65.12) | 5.694 | 9 (29.03) | 9.246 | 33 (55.93) | 1.159 |
| Third | 15 (34.88) | (0.017) | 22 (70.97) | (0.002) | 26 (44.07) | (0.281) |
| **Current accommodation** | | | | | | |
| Hostel | 41 (95.35) | 2.674 | 29 (93.55) | 0.733 | 51 (86.44) | 1.721 |
| Day scholar | 2 (4.65) | (0.177)* | 2 (6.45) | (0.494)* | 8 (13.56) | (0.307)* |
| **Previous hostel stays** | | | | | | |
| Yes | 29 (67.44) | 1.879 | 23 (74.19) | 3.929 | 30 (50.85) | 5.014 |
| No | 14 (32.56) | (0.170) | 8 (25.81) | (0.047) | 29 (49.15) | (0.025) |
| **Family Residence** | | | | | | |
| Urban | 28 (65.12) | 0.303 | 20 (64.52) | 0.260 | 42 (71.19) | 0.685 |
| Rural | 15 (34.88) | (0.581) | 11 (35.48) | (0.610) | 17 (28.81) | (0.408) |
| Mode of travel to hometown | | | | | | |
| Bus | 7 (16.28) | 0.340 | 15 (48.39) | 7.038 | 11 (18.64) | 0.934 |
| Flight | 10 (23.26) | (0.952) | 3 (9.68) | (0.074)* | 8 (13.56) | (0.842)* |
| Train | 21 (48.84) | | 9 (29.03) | | 11 (18.64) | |
| Car/bike/auto | 5 (11.63) | | 4 (12.90) | | 29 (49.15) | |
| **Father's education level** | | | | | | |
| Illiterate#/up to high school | 5 (11.63) | 2.325 | 2 (6.45) | 1.970 | 2 (3.39) | 5.212 |
| Secondary level/Diploma | 9 (20.93) | (0.349)# | 9 (29.03) | (0.370)* | 10 (16.95) | (0.074)* |
| Graduate and above | 29 (67.44) | | 20 (64.52) | | 47 (79.66) | |
| **Mother's education level** | | | | | | |
| Illiterate#/ Up to high school | 9 (22.50) | 3.058 | 8 (26.67) | 4.677 | 7 (11.86) | 6.632 |
| Secondary level/Diploma | 8 (20.00) | (0.217) | 6 (20.00) | (0.096) | 11 (18.64) | (0.036) |
| Graduate and above | 23 (57.50) | | 16 (53.33) | | 41 (69.49) | |
| **Parental economic activity** | | | | | | |
| Dual Earner | 16 (37.21) | 0.158 | 11 (35.48) | 0.003 | 21 (35.59) | 0.019 |
| Single Earner | 27 (62.79) | (0.691) | 20 (64.52) | (0.951) | 38 (64.41) | (1.000)* |
| **Number of siblings** | | | | | | |
| One or more | 40 (93.02) | 0.927 | 2 (6.45) | 0.733 | 54 (91.53) | 0.548 |
| None | 3 (6.98) | (0.505)* | 29 (93.55) | (0.494)* | 5 (8.47) | (0.507)* |

*Fisher's Exact Test; [1]-*Vs.* No depression [2]-*Vs.* No internet addiction [3]-*Vs.* Normal nutritional status; #No formal education

**Table 4: Depression, Internet addiction and Malnutrition among the junior medical students by demographic and mobile phone usage characteristics**

| Variable | Depression | p value^ | Internet addiction | p value^ | Malnutrition⌐ | p value* |
|---|---|---|---|---|---|---|
| **Age in years** | 19.25 (2.05) | 0.702 | 19.32 (2.11) | 0.868 | 19.08 (1.37) | 0.566 |
| **Distance from home (km)†** | 800(300,1550) | 0.611 | 461(300, 1350) | 0.318 | 650(150,1480) | 0.118 |
| **Hours of travel from home†** | 6 (3, 17) | 0.577 | 7 (2.5, 18) | 0.792 | 6 (2.25,18) | 0.500 |
| **Academic score‡** | | | | | | |
| First Semester | 90.81 (7.83) | 0.775 | 92.24 (10.78) | 0.052 | 90.46 (8.07) | 0.789 |
| Third Semester | 64.36 (5.12) | 0.147 | 64.29 (5.77) | 0.066 | 66.83 (6.72) | 0.386 |
| **Age at mobile phone initiation (year)†** | 16 (14, 18) | 0.609 | 16 (14, 17) | 0.510 | 16 (15,75) | 0.808 |
| **Age at mobile phone ownership (year)†** | 17 (16, 18) | 0.576 | 17 (16, 18) | 0.284 | 17 (16,18) | 0.281 |
| **Usage per day (minutes)†** | | | | | | |
| Calling | 60 (30,60) | 0.582 | 30 (60,30) | 0.052 | 60 (30,60) | 0.972 |
| Social media | 60 (30,120) | 0.575 | 120 (160,210) | 0.000 | 60 (30,105) | 0.175 |
| Gaming | 30 (30,90) | 0.942 | 60 (30,120) | 0.135 | 30 (30,60) | 0.546 |
| Music | 60 (30,120) | 0.199 | 60 (30,120) | 0.520 | 60 (30,120) | 0.956 |
| Internet surfing | 60 (30,105) | 0.884 | 60 (30,120) | 0.521 | 60 (30,60) | 0.970 |
| Academic purpose | 60 (30,60) | 0.473 | 60 (30,60) | 0.757 | 60 (30,60) | 0.795 |

*Mann Whitney U Test; [1]-*Vs.* No depression [2]-*Vs.* No internet addiction [3]-*Vs.* Normal nutritional status; † Median (IQR); ‡Mean (SD)
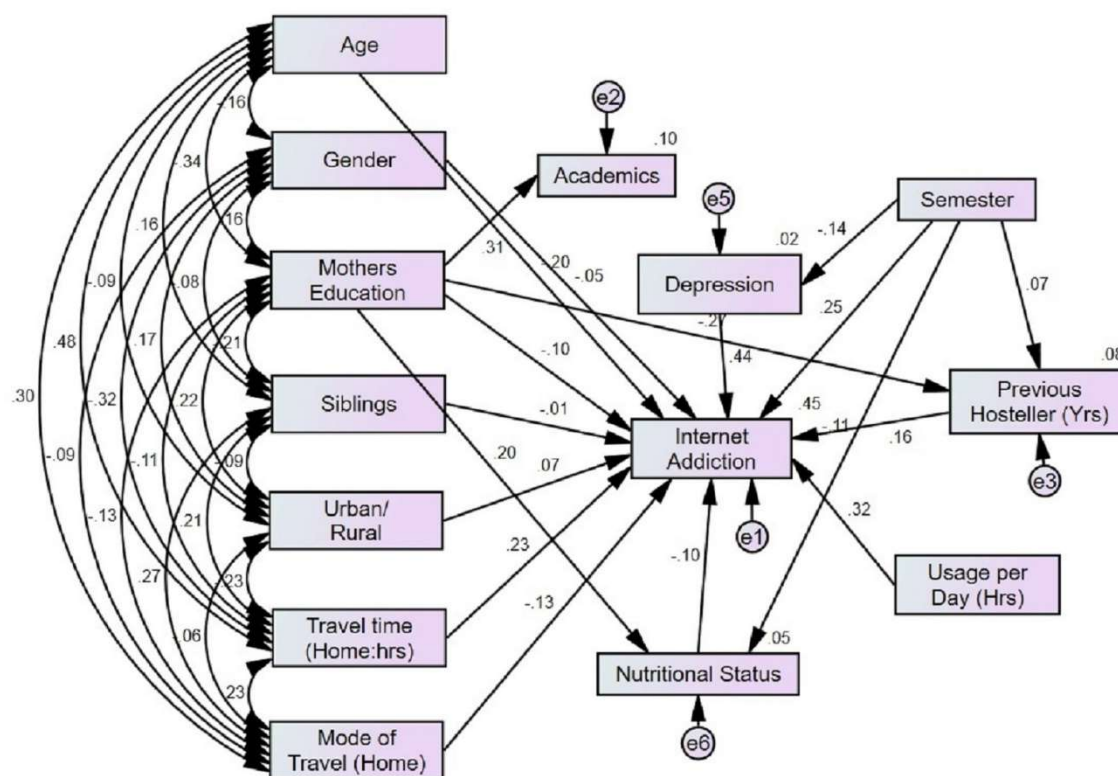
**Figure 1: Structural equation model of the interrelationships between the study variables**

Students with internet addiction used social media for longer duration on a daily basis than those without internet addiction (p = 0.000) (Table 4).

Depressed students were 2.27 times (95% CI = 0.95, 5.41) more likely to be addicted to the internet (p = 0.062). All students with moderately severe and severe depression had internet addiction.

**Nutritional Status**

The prevalence of under nutrition was 7.22% (n = 7). Males were more undernourished (OR = 1.59; 95% = 0.29, 8.65) than females. There were 18 (18.6%) students who were overweight (males = 11; females = 7). The prevalence of obesity was 35.05% (n = 34). Gender did not affect malnutrition (p = 0.959). Nutritional status was also found to be significantly associated with internet addiction (p = 0.043) whereas malnutrition (underweight/overweight/obesity) was associated with previous hostel stay (p = 0.025) and mother's education level (p = 0.036).

Structural equation model given in figure 1 maps all the interrelationships as mentioned in the above paragraphs. The semester of study, depression, duration of smartphone use per day predict the internet addiction significantly (standardized regression coefficients above 0.25) after adjusting for all the confounders. The model also shows peripheral associations between the maternal education with malnutrition, academics and previous hostel stay in addition to covariance with number of siblings and family res-

idence etc. The model had a relative chi-square (CMIN/DF) of 2.532 which is considered acceptable.[8] The overall squared multiple correlations is significant for internet addiction with a value of 0.394, that is, it is estimated that the predictors of internet addiction explain 39.4 percent of its variance.

**DISCUSSION**

This study investigated the interrelationships of depression, internet addiction and nutritional status of two batches of medical students in a newly established medical institute in South India. The prevalence of depression in the present study was in the range 6.1% to 76.21% among similar studies done elsewhere.[8,9] The prevalence of various grades of depression were also similar to those found in previous studies.[10] However, as compared to other studies, the present study found lesser number of females suffering from depression.[8,10] This was possibly due to fewer female participants in the present study. Systematic reviews have reported male gender, rural background, high academic achievement, having a sibling, lower parental education and economic status as predictors of depression.[9]

As compared to seniors, depression was found to be higher among the first semester students, as reported earlier.[11,12] The present study finding could possibly be attributed to the first semester students' recent relocation from their homes to a new setting. Moreover, preclinical years are particularly stressful and this requires early identification for timely in-

tervention to avoid progression into maladjustment disorders in the future. Support services could also include formal mentoring by designated seniors or faculty. In this regard, the study institute has a running mentorship programme to tide over the temporary crisis.

The prevalence of internet addiction in the present study was lower than the prevalence reported from other countries.[13,14] However, it was similar to those reported from India.[2,15] Internet addiction in the present study was significantly higher in the senior batch as compared to the first semester students. Social media use was also more in the senior batch. The students with moderate to severe depression were also more addicted to the internet as reported earlier.[13,16] Internet addiction has been reported to increase with longer duration of medical studies, extending well into the post-graduate years.[17] Therefore it would be worth investing in early identification and mitigation of depression as well as internet addiction from the initial years of medical studies.

As reported earlier, gender and internet addiction were not found to be significantly associated in the present study.[4] This is in contrast to several studies which did find an association between male students and internet addiction.[3,16] In the present study, longer duration of hostel stay was found to be associated to higher chances of internet addiction. The need for connectedness and communication while staying away from home and friends could be the precipitating factor behind this. Medical institutes could work towards provision of student friendly learning activities and healthy extracurricular activities in order to prevent overindulgence in the virtual world by budding medical professionals.

In the present study, only social media use was significantly associated with internet addiction. Social media use as a significant portion of the use of internet underscores the immediate intervention required to move the attention of students away from life on the internet. In this regard, browsing, gaming and other entertainment have been reported to be predictors of internet addiction.[3] In contrast to previous studies, the present study did not find significant association between academic performance and internet addiction.[18] However, these findings could serve as an early warning to intervene earlier than to wait until there is deterioration in academic performance.

Our study also found significant association between internet addiction and nutritional status of medical students, though BMI was higher than previous studies.[4] In contrast to our study which found underweight and overweight to be more prevalent among male students, a previous study reported female students to be more underweight and male students to be overweight.[4] The high prevalence of obesity in the present study is indeed a warning for taking preventive measures to avert health consequences and em-phasize the need to wean the students from the sedentary act of using the internet to encouraging physical activity.

The strength of the study is that the multifaceted role adjustment by newly inducted medical students to a budding central institute could be modelled using the framework of structural equation modelling. The variables of depression, nutritional status as well as internet addiction were interlinked with each other along with contributions from the socio-demographic variables in a convincing manner. Maternal education was found to be linked to both previous hostel stay as well as nutritional status in addition to internet addiction as a by-product of the model.

Study limitations include the small sample size, less female participants and cross-sectional design of the study in drawing temporal inferences between depression, internet addiction and malnutrition. However important insights have been gained into the unmet needs of the students. This will help the institute authorities in designing programs for student welfare for optimal functioning. Self-reported information on academic scores, symptoms of depression and/or internet addiction may have been influenced by social desirability bias. However, the data was collected by a peer student investigator with the assurance of confidentiality.

In conclusion, depression was significantly higher among first semester students whereas internet addiction was significantly higher among third semester students. Students who stayed longer in a hostel before joining the institute and used social media excessively were more addicted to the internet. Nutritional status was found to be significantly associated with internet addiction and there was high prevalence of obesity among the study participants. The present study provides important insights into depression, development of internet addiction and nutritional status in the initial years of medical education.

## REFERENCES

1. Heinen I, Bullinger M, Kocalevent RD. Perceived stress in first year medical students - associations with personal resources and emotional distress. BMC Med Educ. 2017;17(1):4. doi: 10.1186/s12909-016-0841-8

2. Balhara YPS, Gupta R, Atilola O, Knez R, Mohorović T, Gajdhar W, et al. Problematic Internet Use and Its Correlates Among Students from Three Medical Schools Across Three Countries. Acad Psychiatry. 2015;39(6):634–8. doi: 10.1007/s40596-015-0379-9

3. Zhang MWB, Lim RBC, Lee C, Ho RCM. Prevalence of Internet Addiction in Medical Students: a Meta-analysis. Acad Psychiatry. 2018;42(1):88-93. doi: 10.1007/s40596-017-0794-1.

4. Ohlsson C, Bygdell M, Sondén A, Jern C, Rosengren A, Kindblom JM. BMI increase through puberty and adolescence is associated with risk of adult stroke. Neurology. 2017;89(4):363–9. doi: 10.1212/WNL.0000000000004158

5. Spitzer RL, Kroenke K, Williams JB. Validation and utility of a self-report version of PRIME-MD: the PHQ primary care study.

Primary Care Evaluation of Mental Disorders. Patient Health Questionnaire. JAMA. 1999;282(18):1737–44. doi: 10.1001/jama.282.18.1737

6.  Young KS. Caught in the Net: How to Recognize the Signs of Internet Addiction--and a Winning Strategy for Recovery | Wiley [Internet]. New York: John Wiley & Sons; 1998 [accessed 2021 January 14]. Available from: https://www.wiley.com/en-in/Caught+in+the+Net%3A+How+to+Recognize+the+Signs+of+Internet+Addiction+and+a+Winning+Strategy+for+Recovery-p-9780471191599

7.  W  Schumacker RE, Lomax RG. A beginner's guide to structural equation modeling, 2nd ed. Mahwah, NJ, US: Lawrence Erlbaum Associates Publishers; 2004. xii, 498 p. (A beginner's guide to structural equation modeling, 2nd ed.).

8.  Coentre R, Faravelli C, Figueira ML. Assessment of depression and suicidal behaviour among medical students in Portugal. Int J Med Educ. 2016;7:354–63. doi: 10.5116/ijme.57f8.c468

9.  Mao Y, Zhang N, Liu J, Zhu B, He R, Wang X. A systematic review of depression and anxiety in medical students in China. BMC Med Educ. 2019;19(1):327. doi: 10.1186/s12909-019-1744-2

10. Pham T, Bui L, Nguyen A, Nguyen B, Tran P, Vu P, et al. The prevalence of depression and associated risk factors among medical students: An untold story in Vietnam. PloS One. 2019;14(8):e0221432. doi: 10.1371/journal.pone.0221432

11. Fawzy M, Hamed SA. Prevalence of psychological stress, depression and anxiety among medical students in Egypt. Psychiatry Res. 2017;255:186–94. doi: 10.1016/j.psychres.2017.05.027

12. Silva V, Costa P, Pereira I, Faria R, Salgueira AP, Costa MJ, et al. Depression in medical students: insights from a longitudinal study. BMC Med Educ. 2017;17(1):184. doi: 10.1186/s12909-017-1006-0

13. Boonvisudhi T, Kuladee S. Association between Internet addiction and depression in Thai medical students at Faculty of Medicine, Ramathibodi Hospital. PLoS ONE. 2017;12(3):e0174209. doi: 10.1371/journal.pone.017420927

14. Javaeed A, Zafar MB, Iqbal M, Ghauri SK. Correlation between Internet addiction, depression, anxiety and stress among undergraduate medical students in Azad Kashmir. Pak J Med Sci. 2019;35(2):506–9. doi: 10.12669/pjms.35.2.169

15. Nath K, Naskar S, Victor R. A Cross-Sectional Study on the Prevalence, Risk Factors, and Ill Effects of Internet Addiction Among Medical Students in Northeastern India. Prim Care Companion CNS Disord. 2016;18(2):10.4088/PCC.15m01909. doi: 10.4088/PCC.15m01909

16. Younes F, Halawi G, Jabbour H, Osta NE, Karam L, Hajj A, et al. Internet Addiction and Relationships with Insomnia, Anxiety, Depression, Stress and Self-Esteem in University Students: A Cross-Sectional Designed Study. PLoS ONE. 2016;11(9):e0161126. doi: 10.1371/journal.pone.0161126 8

17. Grover S, Sahoo S, Bhalla A, Avasthi A. Problematic internet use and its correlates among resident doctors of a tertiary care hospital of North India: A cross-sectional study. Asian J Psychiatr. 2019;39:42-47. doi: 10.1016/j.ajp.2018.11.018

18. Alkhalaf AM, Tekian A, Park YS. The impact of WhatsApp use on academic achievement among Saudi medical students. Med Teach. 2018;40(sup1):S10-S14. doi:10.1080/0142159X.2018.1464652