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Original Research Article

Technostress in medical and allied field: an empirical study among under graduate public health science students of Purbanchal University affiliated colleges in Kathmandu

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ABSTRACT

Background: Technostress among students may lead to a higher burden on higher education institutions through a decrease in productivity, dropouts, and deviation from academic work. Students have a different set of characteristics, which makes them an interesting group to be studied. The aim of the study was to find out the status of technostress among respondents.
Methods: Analytical study was conducted among 460 undergraduate public health science students of Purbanchal University in Kathmandu valley. The census method was used for data collection. Standard questionnaires and IDI guidelines are used as data collection tools. Data entry was done in Epidata and analysis was done in SPSS.
Results: Mean value of 460 respondents was 22.61. Positive correlation was observed between the technostress and stress (p=0.01), depression (p=0.01), and anxiety (p=0.05). Academic productivity has positive correlation with stress (p=0.05) and depression (p=0.05). Stress was significantly associated with grade (p<0.001), depression was significantly associated with grade (p=0.003), techno overload (p=0.004), techno invasion (p=0.023), and anxiety was significantly associated with age (p=0.008), grade (p=0.009), techno overload (p=0.023), techno invasion (p=0.016), techno complexity (p=0.023).
Conclusions: The study showed a positive association between technostress and academic qualification. There is a need for an awareness program on technostress and mental health to provide comprehensive knowledge on mental health.

Keywords: Academic productivity, Anxiety, Depression, Nepal, Stress, Technostress

INTRODUCTION

Technology is extensively used to automate academic processes and enhance learning.[1] However, a dearth of empirical studies has examined the prevalence of technostress among the younger generation, particularly students. Technostress among students may lead to a higher burden on the higher education institutions through a decrease in productivity, dropouts, and deviation from academic work. Moreover, students of the present generation have a different set of characteristics and habits, which makes them an interesting group.[2,3] These students were born in the internet-connected world and ICT is part of their routine.[1] Digital natives are habituated to immediate and autonomous access to information, multitasking, nonlinear learning, and dynamic graphics.[4] Therefore, it would be interesting to test whether the technostress is relevant to this generation, its prevalence among various demographics of students, and its impact on academic productivity.

Technostress was modeled as a second-order construct, which has five sub-dimensions namely techno-overload (5), techno-invasion (4), techno-complexity (5), techno-insecurity (5), and techno-uncertainty (4). Techno-overload is an effect of technology that forces students to work faster and longer.[5] Techno-invasion is an effect of technology that forces students to work beyond regular college hours and invades their personal lives. Techno-complexity is a situation where technology makes students feel that their skill sets are inadequate. Techno-insecurity is the situation where the students feel threatened about their poor academic performance compared to other students, who have a better knowledge of using technology. Finally, techno-uncertainty is a situation where frequent changes and upgrades in technology, create uncertainty for students.[6-8]

In this backdrop, we use the technostress scale proposed by Tarafdar, the academic productivity scale proposed by Torkzadeh and Doll, and the Das21 scale proposed by Syd Lovibond and Peter Lovibond then validate the instrument in an academic context and measure the technostress level.[8-10] Technostress is an adjustment due to the inability to cope with emerging technologies, affecting mental health further which results in negative impacts on academic productivity along with numerous effects like headaches, irritability, eye strain, backaches, neck pain, stiff shoulder, joint pains, mental fatigue, depression, nightmares, panic, resistance, and a feeling of helplessness.[11,12]

Research related to technostress in students hadn't been conducted in Nepal until now so, we had taken the initiative and done research work on this topic to find out the impacts of technostress in public health students. The study aimed to address the following research question: What are the effects of technostress in a pandemic situation? How does technostress affect individual commitment? What are the relationship between individual characteristics and technology?

METHODS

Study design and participants

A mixed analytical study was conducted from December 2021 to June 2022 among 460 undergraduate public health science students of Purbanchal university affiliated colleges in Kathmandu valley. The study setting was Kathmandu valley of Bagmati province. Census was employed as sampling technique.

The inclusion criteria were health science students studying under Purbanchal University. Students absent on the data collection day and could not provide consent were excluded.

Sample size wasn't calculated because all colleges (total 8) were included in this study.

Measures

Multidimensional scale (dependent variables)

Technostress was measured using a 23-item scale proposed by Tarafdar.[8] All the items were carefully measured on a five-point Likert scale. Technostress was modeled as a second-order construct with five sub-dimensions: techno-overload, techno-invasion, techno-complexity, techno-insecurity, and techno-uncertainty. Twenty-three questions measured the five components of technostress. The sub-constructs techno-invasion, techno-insecurity, and techno-uncertainty were modified and adapted to suit the academic context. The possible range for the total technostress score was 27 to 92.

Academic productivity (dependent variables)

Academic productivity was measured by a four-item scale adapted from previous works of Torkzadeh and Doll and Tarafdar.[8,9] In this study, the scale was modified according to the academic context. The changes to the original instrument were elaborated in a separate section in appendix 1. A five point Likert-type scale measured responses from strongly agree (1) to strongly disagree (5). The possible range for the academic productivity was 7 to 20.

Mental health symptoms (dependent variables)

Mental health symptoms were assessed using the depression anxiety stress scales (DASS-21) developed in New South Wales in Australia by Syd Lovibond and Peter Lovibond.[10] It examines 3 distinct but interconnected topics: depression, anxiety, and stress. The scale consists of 21 items divided into three subscales for depression, anxiety, and stress consisting of seven items each. Participants rated the extent to which they experienced symptoms over the past week on a 4-point Likert scale (0 "Did not apply at all" to 3 "Applied very much or most of the time"). Subscale scores range from 0 to 21 for each subscale. The DASS subscale scores are categorized into normal, mild, moderate, severe, and extremely severe. The latter four categories were re-grouped into mental health problem "present" with the normal category labeled as "absent" for each of the three subscales. The cut-off scores are >9 for depression, >7 for anxiety, and >14 for stress.[13] The Cronbach alpha values of DASS-21 in our study were 0.95 for the overall scale, 0.85 for stress, 0.88 for depression, and 0.84 for anxiety.

Demographic, technology and software related factors

Individual level demographic factors included age, sex, and education qualification. Technology-related factors had knowledge of emerging technology, cultivated new technology, competency to operate technology, problems faced during operating technology, exposure age, and internet regularity. Software related factors included

knowledge of different software, and information site regarding those software.

Data collection

The study was carried out among the undergraduate health science students of Purbanchal University. Information regarding the students was collected from the Purbanchal University affiliated colleges.

Ethical consideration was taken from little Buddha college of health science, public health department affiliated by Purbanchal University. After that, students were enrolled in self-administrated questionnaire. Then one student from one college was enrolled in an In-depth interview (IDI) by selecting purposively. Throughout the data collection and interview procedure, confidence and comfortability were maintained.

Statistical analysis

The quantitative data were presented on descriptive statistics using percentages and tables using the statistical data analysis technique (SPSS 16.0). Characteristics were compared using a t-test for scale variables and a chi-square test for categorical variables. A paired-wise correlation was done to find the correlation among multidimensional scale, academic productivity and Dass 21.

RESULTS

Sample characteristics

Table 1 illustrates the descriptive statistics of sample characteristics measured in categorical and continuous scales, respectively. The mean age of the participants was 22.7 (SD=2.2) years. The highest categories of all participants for categorical variables were female 63.4%, aged 18-25 years (63.4%), 141 (39.1%) respondents from sixth semester.

All respondents have understanding of technology and had the competency to operate those technology. More than half 75.8% male and 77.8% female respondents had an exposure age of 13-20 years, using the internet for >4 hours/day. Around half (58.6%) male and (59.8%) female respondents had faced physical problems (Table 1).

Table 1: Frequency distribution of demographic distribution of respondents.

Characteristics	Sex of participants (n=460)		Total N (%)
	Male (n=99, %=21.5)	Female (n=361, %=78.5)	
Age group (years)			
18-25	31 (31.3)	229 (63.4)	260 (56.5)
26-33	68 (68.7)	132 (36.6)	200 (43.5)
Education qualification			
1st semester	6 (6.1)	27 (7.5)	33 (7.2)
4th semester	35 (35.4)	138 (38.2)	173 (37.6)
6th semester	49 (49.4)	141 (39.1)	190 (41.3)
8th semester	9 (9.1)	55 (15.2)	64 (13.9)
Exposure age			
5-12 years	24 (24.2)	80 (22.2)	104 (22.6)
13-20 years	75 (75.8)	281 (77.8)	356 (77.4)
Internet regularity			
1-4 hours a day	23 (23.2)	37 (10.2)	60 (13.1)
>4 hours a day	76 (76.8)	324 (89.8)	400 (86.9)
Source of information			
Lecturer	73 (73.7)	263 (72.9)	336 (73.1)
Friends	70 (70.7)	253 (70.1)	323 (70.2)
Google	81 (81.8)	307 (85)	388 (84.3)
Faced problems			
Network problems	54 (54.5)	195 (54)	249 (54.1)
Physical problems	58 (58.6)	216 (59.8)	274 (59.5)
Psychological problems	6 (6.1)	17 (4.7)	23 (5)
Mobile related problems	30 (30.3)	126 (34.9)	156 (33.9)

Mean =22.7, Median =22, Std. deviation =2.2

Table 2: Measurement items reliability statistics.

Characteristics	No. of items	Cronbach's alpha	Mean	Min-Max	Standard deviation
Technostress	23	0.82	67.67	27-92	10.67
Overload	5	0.79	15.02	5-25	3.90
Invasion	4	0.81	11.87	4-20	3.40
Complexity	5	0.66	14.53	5-22	3.31
Security	5	0.66	13.25	5-22	3.25
Uncertainty	4	0.81	12.99	4-19	3.23
Academic productivity	4	0.92	16.57	7-20	1.40
DASS21	21	0.95	12.45	0-59	11.90
Stress	7	0.845	4.84	0-19	4.28
Depression	7	0.88	4.06	0-21	4.51
Anxiety	7	0.84	3.55	0-19	3.98

Table 3: Comparison of technostress levels among various student groups.

Characteristics	Technostress			CI	P value
	N (%)	Mean	SD		
Age (years)					
18-25	260 (56.5)	68.10	10.23	-.98-2.95	0.326
26-33	200 (43.5)	67.11	11.22		
Gender					
Male	99 (21.5)	67.11	10.50	-3.09-1.67	0.559
Female	361 (78.5)	67.82	10.73		
Education qualification					
1st sem	33 (7.2)	63.55	11.44	59.49-67.60	0.004*
4th sem	173 (37.6)	69.73	10.24	68.19-71.27	
6th sem	190 (41.3)	66.89	9.99	65.46-68.32	
8th sem	64 (13.9)	66.53	12.39	63.44-69.63	
Exposure age					
5-12	104 (22.6)	67.25	10.39	-2.87-1.80	0.651
13-20	356 (77.4)	67.79	10.76		
Internet regularity					
1-4 hours/day	60 (13.1)	67.32	10.43	-3.31-2.50	0.785
>4 hours/day	400 (86.9)	67.72	10.72		

Both t-test and ANOVA test were used.

Table 4: Paired-wise correlation among technostress, academic productivity, and Dass 21.

	Variables	1	2	3	4	5	6	7	8	9	10	11
1	Technostress	-										
2	T-overload	0.681**	-									
3	T-invasion	0.616**	0.356**	-								
4	T-complexity	0.683**	0.253**	0.300**	-							
5	T-insecurity	0.659**	0.247**	0.222**	0.454**	-						
6	T-uncertainty	0.467**	0.157**	0.023	0.152**	0.172**	-					
7	Academic productivity	-0.029	0.035	0.017	-0.101*	-0.124**	0.073	-				
8	Dass 21	0.137**	0.110*	0.194**	0.114*	0.077	-0.078	0.098*	-			
9	Stress	0.127**	0.132**	0.176**	0.082	0.068	-0.076	0.095*	0.941**	-		
10	Depression	0.150**	0.098*	0.232**	0.127**	0.088	-0.085	0.104*	0.938**	0.833**	-	
11	Anxiety	0.102*	0.076	0.126**	0.107*	0.059	-0.055	0.073	0.913**	0.791**	0.773**	-

**Correlation is significant at the 0.01 level (2-tailed).
*Correlation is significant at the 0.05 level (2-tailed).

Level of technostress among various student groups

Technostress levels were compared between the different demographic profiles of students. A series of independent sample t-tests were conducted to examine whether there exist significant levels of technostress among students grouped based on gender, age, and level of education. The students were grouped into two groups (18-25 and 26-33). The t-test result revealed that technostress had no association between age, gender, exposure age, and internet regularity. However, the ANOVA test revealed that technostress was associated with education qualification (Tables 2 and 3).

Technostress, academic productivity, and Dass21

The relationship between technostress, academic productivity, and Dass21 was examined using spearmen's correlation coefficient. Positive correlation was observed between the total technostress and stress (p=0.01), depression (p=0.01), and stress (p=0.05). In the context of academic productivity positive correlation was observed between stress (p=0.05) and depression (p=0.05) (Table 4).

Table 5: Depression, anxiety, and stress categories, based on scores of DASS-21 subscales.

	Stress N (%)	Depression N (%)	Anxiety N (%)
Absent (normal)	449 (97.6)	398 (86.5)	383 (83.3)
Present	11 (2.4)	62 (13.5)	77 (16.7)
Mild	9 (2)	39 (8.5)	36 (7.8)
Moderate	2 (0.4)	21 (4.6)	33 (7.2)
Severe	0 (0.0)	2 (0.4)	8 (1.7)
Extremely severe	0 (0.0)	0 (0.0)	0 (0.0)

Table 6: Sample characteristics by depression, anxiety, and stress status.

	Stress			Depression			Anxiety		
	Absent N (%)	**Present N (%)**	**P value**	**Absent N (%)**	**Present N (%)**	**P value**	**Absent N (%)**	**Present N (%)**	**P value**
Age (years)									
18-25	252 (96.9)	8 (3.1)	0.272	223 (85.8)	37 (14.2)	0.59	206 (79.2)	54 (20.8)	0.008
26-33	197 (98.5)	3 (1.5)		175 (87.5)	25 (12.5)		177 (88.5)	23 (11.5)	
Sex									
Male	97 (98)	2 (2)	0.785	85 (85.9)	14 (14.1)	0.827	84 (84.8)	15 (15.2)	0.633
Female	352 (97.5)	9 (2.5)		313 (86.7)	48 (13.3)		299 (82.8)	62 (17.2)	
Grade									
1st sem	28 (84.8)	5 (15.2)	<0.001	22 (66.7)	11 (33.3)	0.003	24 (72.7)	9 (27.3)	0.009
4th sem	168 (97.1)	5 (2.9)		155 (89.6)	18 (10.4)		143 (82.7)	30 (17.3)	
6th sem	190 (100)	0 (0.0)		168 (88.4)	22 (11.6)		169 (88.9)	21 (11.1)	
8th sem	63 (98.4)	1 (1.6)		53 (82.8)	11 (17.2)		47 (73.4)	17 (26.6)	
Exposure age									
5-12 years	103 (99)	1 (1)	0.278	87 (83.7)	17 (16.3)	0.33	87 (83.7)	17 (16.3)	0.903
13-20 years	346 (97.2)	10 (2.8)		311 (87.4)	45 (12.6)		296 (83.1)	60 (16.9)	
Internet regularity									
1-4 hours/day	59 (98.3)	1 (1.7)	0.694	53 (88.3)	7 (11.7)	0.659	53 (88.3)	7 (11.7)	0.259
> 4 hours/day	390 (97.5)	10 (2.5)		345 (86.3)	55 (13.8)		330 (82.5)	70 (17.5)	
Technostress M (SD)	67.65 (10.58)	68.36 (14.54)	0.827	67.35 (10.27)	69.68 (12.84)	0.179	67.29 (10.62)	69.55 (10.799)	0.091
Techno overload M (SD)	15.03 (3.86)	14.36 (5.48)	0.695	14.96 (3.77)	15.35 (4.65)	0.004	14.97 (3.79)	15.23 (4.416)	0.023
Techno invasion M (SD)	11.84 (3.36)	13.27 (4.798)	0.347	11.70 (3.27)	12.97 (3.99)	0.023	11.70 (3.38)	12.73 (3.374)	0.016
Techno complexity M (SD)	14.50 (3.29)	15.73 (4.268)	0.226	14.41 (3.25)	15.31 (3.61)	0.069	14.37 (3.26)	15.35 (3.448)	0.023
Techno security M (SD)	13.25 (3.24)	13.45 (3.751)	0.836	13.20 (3.22)	13.61 (3.41)	0.372	13.16 (3.25)	13.71 (3.219)	0.173
Techno uncertainty M (SD)	13.03 (3.22)	11.55 (3.446)	0.187	13.08 (3.16)	12.44 (3.62)	0.189	13.09 (3.21)	12.52 (3.319)	0.17
Academic productivity M (SD)	16.59 (1.41)	17 (1.27)	0.304	16.55 (1.41)	16.71 (1.45)	0.399	16.54 (1.43)	16.73 (1.31)	0.281

Both chi-square and t-test were used.

Sample characteristics by mental health symptoms

Table 6 represents the participant characteristics of stress, depression, and anxiety. The bivariate analysis included age, sex, grade, exposure age, internet regularity, technostress, techno overload, techno invasion, techno complexity, techno security, techno uncertainty, and academic productivity. Here, stress was significantly associated with grade (p<0.001), depression was significantly associated with grade (p=0.003), techno overload (p=0.004), techno invasion (p=0.023), and anxiety were significantly associated with age (p=0.008), grade (p=0.009), techno overload (p=0.023), techno invasion (p=0.016), techno complexity (p=0.023) (Tables 5 and 6).

DISCUSSION

This study was an attempt to find out the technostress among under graduate public health science students of Purbanchal University affiliated colleges in Kathmandu. An analytical study was done in 8 months period. Data were collected by self-administered questionnaires, and in-depth interview. The questionnaire and IDI guidelines were prepared on the basis of previous studies. This study offers personal accounts of total 460 respondents who were taken as the subjects from diverse background i.e. age group, gender, and education qualification etc. All the procedures and methods were implemented carefully and ethical consideration were followed strictly.

In this current study among total 460 respondents, nearby half of the respondents 63.4% were of 18-25 age group. Gender wise there was a higher number of female respondents i.e. 78.5%. On the basis of education qualification higher number of respondents 39.1% were from 6th semester. Cronbach alpha value was 0.79, 0.81, 0.66, 0.66, 0.81, and 0.92 of techno overload, techno invasion, techno complexity, techno security, techno uncertainty, and academic productivity respectively. Similar study conducted in India have total 672 respondents among which 18-22 age group have higher respondents i.e. 80%. Gender wise there was a higher number of female respondents i.e. 55%. On the basis of education qualification higher number of respondents were undergraduate i.e. 53%. Cronbach alpha value was 0.78, 0.78, 0.84, 0.70, 0.79, and 0.87 of techno overload, techno invasion, techno complexity, techno security, techno uncertainty, and academic productivity respectively.[14] In this current study positive correlation was observed between the total technostress and stress (p=0.01), depression (p=0.01), and anxiety (p=0.05). In context of academic productivity positive correlation was observed between the stress (p=0.05), and depression (p=0.05). Similar study conducted in Indonesia positive correlation was observed between the total technostress and other variables (p<0.001).[15]

In this current study 2.4%, 13.5%, and 16.7% respondents are facing stress, depression, and anxiety respectively. In this study stress was significantly associated with grade (p<0.001), depression was significantly associated with grade (p=0.003), techno overload (p=0.004), techno invasion (p=0.023), and anxiety were significantly associated with age (p=0.008), grade (p=0.009), techno overload (p=0.023), techno invasion (p=0.016), techno complexity (p=0.023). In the similar study conducted in Rupandehi, and Arghakachi district of province 5 12.1%, 15.4%, and 18.1% respondents were facing stress, depression, and anxiety. Stress was significantly associated with household income, watch television, read newspaper, perceived health status, smoking, physical activity, adverse life events, number of chronic conditions, functional ability, participation in social activities, and social support score. Depression was significantly associated with gender, education, present occupation, main source of household income, watch television, read newspaper, perceived health status, smoking, physical activities, living arrangements, adverse life events, number of children, number of chronic conditions, functional ability, participation in social activities, and social support score. Anxiety was significantly associated with gender, education, marital status, main source of household income, grand parenting, watch television, read newspaper, perceived health status, smoking, physical activity, living arrangements, migration of children, adverse life events, number of chronic conditions, functional ability, participation in social activities, and social support score.[16]

Number of sample was limited due to time constraint. All the variables couldn't be included in the study due to the limitation of resources.

CONCLUSION

This study was an attempt to find out the technostress among under graduate public health science students of Purbanchal University affiliated colleges in Kathmandu valley with total 460 respondents where the mean value was 22.61, median age was 22, and standard deviation was 2.167.

The study shows a positive association between technostress and academic qualification. There is a need for an awareness program on technostress and mental health to provide comprehensive knowledge on mental health in college students, and there is also a need for intervention of mental health-related approaches with strong supervision and monitoring to strengthen planning and budgeting in mental health-related programs and policy.

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APPENDIX I:

Summary of modification done to the original instrument.

Construct	Original item	Comments
Techno-complexity (TC1)	I do not know enough about this technology to handle my job satisfactorily	"Job" was replaced with academic work
Techno-complexity (TC4)	I find new recruits to this organization know more about computer technology than I do	"New recruits to this organization" replaced with "my peers"
Techno-insecurity (TIS1)	I feel constant threat to my job security due to new technologies	"Job security" replaced with "performance".
Techno-insecurity (TIS2)	I have to constantly update my skills to avoid being replaced	"Being replaced" substituted with "poor performance"
Techno-insecurity (TIS3)	I am threatened by coworkers with newer technology skills	"Coworkers" replaced with "classmates"
Techno-insecurity (TIS4)	I do not share my knowledge with my coworkers for fear of being replaced	Same as TIS2 and TIS3
Techno-insecurity (TIS5)	I feel there is less sharing of knowledge among coworkers for fear of being replaced	Same as TIS2 and TIS3
Techno-uncertainty (TU1-TU4)	TU1:There are always new developments in the technologies we use in our organization	In all items the word "organization" replaced with "institute"
Academic Productivity P1-P4	P1: This technology helps to improve the quality of my work	In all items, prefix of "academic" was added to terms "productivity" and "work"