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MENTAL HEALTH AMONG ENGINEERING GRADUATES – A COHORT STUDY

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ABSTRACT:
In recent times, engineering education has become increasingly complex. Engineering students enter a challenging sector in higher education and are potentially at risk of poor mental health. Mental health is a state of well-being in which an individual has the ability to cope with the normal stress. Conversely, poor mental health has a detrimental effect on students' experiences, wellbeing, and achievement. The current research is to delineate the perceptions of Engineering graduates on anxiety, perceived stress and mental health in the State of Telangana with special reference to their group, gender, and community. This research has been carried out at Holy Mary Institute of Technology and Science, Bogaram, Medchal district of Telangana State. The sample consists of a corpus of one hundred and seventy (170) Engineering graduates. Three instruments used were viz., Generalized Anxiety Disorder 7-item (GAD-7) scale developed by Robert L. Spitzer et al (1999); Perceived Stress Scale (PSS-10) by Cohen, S., & Williamson, G. (1988).and Mental Health Screening Questionnaire by Sharma P and Devkota G (2019). Statistical tools like t-test and ANOVA were employed to interpret the results. The results of the study demonstrated that there found to be statistically significant difference between the perceptions of Engineering graduates on anxiety, and Stress with special reference to their group, gender, while, a significant difference was revealed with regard to community. Implications as well as directions for future research were also portrayed.
Key words: Mental health, Engineering graduates, Anxiety, Stress. Well-being, Achievement.

INTRODUCTION:

Pursuing a college education involves significant life transformations such as changes in independence, environment, routine, and social support; introduction to new substances; and increases in academic pressures and competition. These changes can induce stress and contribute to mental health concerns (Wright. et al. 2023). Further, college represents a crucial developmental period, fraught with numerous challenges across the academic, social and personal domains. Most students successfully overcome these challenges to achieve their potential. However, in a significant proportion, these stressors interact with genetic and psychosocial adversities, increasing the likelihood of mental health issues.

In recent times, Engineering education has become increasingly complex. Engineering students enter a challenging sector in higher education and are potentially at risk of poor mental health and less likely to seek help when experiencing poor mental health (Tait J.E et al 2024).

SIGNIFICANCE OF THE STUDY

Mental health issues are prevalent among college students. There are robust and consistent reports from across the world that students in colleges have higher rates of depression, anxiety and suicides. The World Mental Health Survey among college students across 21 countries has reported that a fifth (20.3%) had experienced DSM-IV/CIDI (The Diagnostic and Statistical Manual of Mental

Disorders-IV/ The Composite International Diagnostic Interview) psychiatric disorders in the preceding 12 months. Similar findings have also been reported from various States in India. Late adolescence and early adulthood also have a greater incidence of severe mental illness owing to the neurodevelopmental trajectory. It is estimated that 75 per cent of those with severe mental illness would have experienced significant symptoms by the age of 25 yrs. Thus, a sub-group of students are likely to experience the onset of severe mental illness during their time in college. The higher rates of suicide among college students also correlate with mental health. Worldwide, the annual rates for suicidal ideations, plans and attempts among college students have been estimated to be 16, 3 and 1.2 per cent, respectively. In 2018, as many as 10,000 student suicides have been reported in our India. . Surprisingly, the consistent finding of increased vulnerability among students from the lower socio-economic strata, minorities or disadvantaged communities. Moreover, higher levels of distress have been associated with increased food intake, poor diet quality and consequent obesity. Globally, these risk behaviours concurrently account for almost two-thirds of cardiovascular deaths and a 3.35-fold increase in cancer mortality.

NEED FOR THE STUDY:

Mental health issues in colleges across the world have been showing a marked increase both in numbers and severity, presumably owning to rapid socio-economic transitions, migration, the disintegration of social networks and substance use. Educational factors like intensive curriculum, heightened competition, academic difficulties and poor competence of instructors also contribute to distress. Although many of these factors remain understudied in the Indian context, the cross-cultural commonalities of risk factors suggest that this is likely to be applicable here too. Mental health problems have a profound impact on college students. In addition to drop-outs and poor academic achievement, it can also have long-term adverse impacts on employment, social relationships and health (Jaisoorya, T.S. (2021).

OBJECTIVES OF THE STUDY:

The chief objective of this investigation is to appraise the perceptions of Engineering graduates on anxiety, perceived stress and mental health in the State of Telangana with special reference to their group, gender, and community

HYPOTHESIS OF THE STUDY:

There is no statistically significant difference between the perceptions of Engineering graduates on anxiety, perceived stress and mental health in the State of Telangana with special reference to their group, gender and community .

LITERATURE:

Review of previous literature entails the methodical analysis and interpretation of prior research, theories, procedures, and findings that are pertinent to a given subject. Writing a literature review identifies gaps, trends, and areas for additional research in addition to helping place the current work within the framework of previous studies.

Andrew Danowitz and Kacey Beddoes, (2018) investigated the knowledge gap surrounding mental health across students in different engineering disciplines in higher education. An analysis of the data shows that while mental health and wellness issues are prevalent across all majors, specific disciplines appear to have very different mixes of conditions and issues affecting their students.

Negi, A. S., Khanna, A., & Aggarwal, R. (2019). examined the levels of stress, anxiety and depression in male and female engineering students. It was found that female students are more stressed and depressed and anxious than male students.

Niyatisheokand, et al. (2020) conducted a cross sectional, interview based, non-interventional study on the engineering students Alcohol use was present in 43(11.7%) of students, cannabis intake was present in 11(4%), nicotine intake was reported by 39(14.2%) of students and only one student reported of taking opioid. it was established that poor sleep quality in engineering students was significantly associated with poor mental and physical health.

Somya, S., Agrawal and Shwetha, S. M., Krishna. (2021) in a pilot study highlighted students help seeking behavior in case of mental health conditions such as depression and anxiety in India and Taiwan universities. A higher number of male students were found to experience anxiety and depression than their female student counterparts

Kacey Beddoes and Andrew Danowitz (2022) presented findings from an interview study with current and former engineering students. The analysis identifies not only what aspects of engineering education undermine mental health but also explains how they do so.

Bork, Sarah Jane; Mondisa, Joi-Lynn (2022) reviewed the literature concerning engineering graduate students' mental health, focusing on academic outcomes, mental health measures, and mental health. Nineteen of the 4,826 unique studies identified were included in the review. Ten academic outcomes and 13 mental health measures were discussed. Mental health findings were grouped into five themes: social support and sense of belonging; student–advisor relationship; cultural barriers faced by international students; gender and racial stereotypes; and generalized findings.

Jensen et al (2023) explored: how engineering students describe their experiences related to stress and mental health and norms and expectations engineering students share about stress and mental health. The study identified three themes related to stress and mental health in engineering culture, firstly, engineering workload as a defining stressor, secondly, specific barriers that prevent engineering students from seeking help for mental health concerns, and finally, reliance on peers to cope with stress and mental health distress.

Wright et al (2023) examined beliefs that undergraduate engineering students have about barriers and facilitators to seeking professional help for their mental health. Identified four themes: Navigating the system impacts personal agency; sacrifices associated with help-seeking act as a barrier; engineering culture acts as a barrier to help-seeking; and student confidence in help-seeking varies significantly. These themes portray the effect of perceived barriers and facilitators on students' personal agency for accessing mental health care.

Sasan Radan et al (2023) in a book chapter collates important factors affecting mental health in STEM, identifies existing efforts, and highlights research gaps. Contributions of this chapter are two-fold: (a) a working taxonomy of the most commonly reported factors affecting mental health in STEM along with the systematic efforts done to improve these factors, and (b) research gaps in systematic efforts which improve the factors identified in the taxonomy, paving the way for future research to fill these gaps.

Fatima et al (2024) explored the effect of academic stress on the mental health of the undergraduate university students. The results revealed the significant correlation between the variables and academic stress was found a significant predictor of mental health issues.

Seven key themes emerged from the study undertaken by **Tamta, D. (2024)** which include the influence of the academic environment on student's mental health, students coping strategies, student's perceptions of mental health services, institutional support, barriers to seeking support in university setting, student's attitudes towards counselling, and cultural influences on student's mental health.

J. E. Tait, e t al (2024) carried out a scoping review using Joanna Briggs Institute scoping review methodology. Ten databases were searched over a three-year period. Searches identified 191 sources of evidence after title screening and 33 sources of evidence were included for final extraction following full-text screening. Included studies represented over 4000 engineering students from 10

countries. Study results indicated reduced stress and anxiety, improved academic achievement, improved communication, motivation, physiological responses, attitude, and increased physical activity, health awareness, and confidence. Mindfulness activities appear to be helpful to engineering students.

Maji Suchitra et al (2024) unearthed the antecedent factors associated with mental health crises among engineering students. The results indicated that academic amotivation significantly mediates the relationship between academic stress and mental health status. Moreover, male engineering students score significantly higher in mental health status and significantly lower in extrinsic motivation-identified than female students.

Cherian AV et al (2024) documented findings from a survey that examined psychological distress, suicidal thoughts and behaviours, and health and social indicators among college students in India. : Findings indicate that 18.8% and 12.4% of students had considered suicide over their lifetime and in the past year, respectively, with 6.7% having attempted it at some point in their lives. Among those with lifetime suicidal thoughts, more than one-third (38.1%) reported having previously disclosed these thoughts to someone, with friends being the most common confidants. Furthermore, one-third (33.6%) of participants reported moderate to severe symptoms of depression, and one-quarter (23.2%) reported moderate to severe symptoms of anxiety.

METHODOLOGY:

A cohort study is a type of longitudinal study where a group of individuals often sharing a common characteristic or experience, is followed over an extended period of time to study and track outcomes, typically related to specific exposures or interventions.

The sample consists of a corpus of one hundred and seventy (170) Engineering graduates. Three instruments used were viz., Generalized Anxiety Disorder 7-item (GAD-7) scale developed by Robert L. Spitzer et al (1999); Perceived Stress Scale (PSS-10) by Cohen, S., & Williamson, G. (1988).and Mental Health Screening Questionnaire by Sharma P and Devkota G (2019). This research has been carried out at Holy Mary Institute of Technology and Science, Bogaram, Medchal district of Telangana State. Statistical tools like t-test and ANOVA were employed to interpret the results.

RESULTS AND DISCUSSION:

Table showing course pursed by the sample

Course	Frequency	Per cent	Valid Per cent	Cumulative Per cent
CSE	67	39.4	39.4	39.4
DS	7	4.1	4.1	43.5
AIML	72	42.4	42.4	85.9
IoT	5	2.9	2.9	88.8
Others	19	11.2	11.2	100.0
Total	170	100.0	100.0	

It is clear from the table, a large majority of the sample (42.9%) are from AIML group, followed by a good majority of the respondents (39.4%) are from CSE Group. On the other hand, a meagre number of respondents (11.2%) are from other groups, whereas, (4.1%) are from Data Science group and the remaining (2.9%) are from Internet of Things group.

Table showing gender of the sample

Gender		Frequency	Per cent	Valid Per cent	Cumulative Per cent
Valid	Female	46	27.1	27.1	27.1
	Male	124	72.9	72.9	100.0
	Total	170	100.0	100.0	

As per gender of the sample is concerned, a scintillating majority (72.9%) are male, while the residual sample (27.1%) are female selected for the present investigation.

Table showing community of the sample

Community		Frequency	Per cent	Valid Per cent	Cumulative Per cent
Valid	OC	96	56.5	56.5	56.5
	BC	50	29.4	29.4	85.9
	SC	17	10.0	10.0	95.9
	ST	7	4.1	4.1	100.0
	Total	170	100.0	100.0	

With regard to Community of the sample, more than half of the sample (56.5%) are from other Castes, whereas, another good majority of the respondents (29.4%) are drawn from Backward Castes. Just a simple majority (10.0%) is from Scheduled castes and the remaining (4.1%) are from Scheduled Tribe community.

HO 1 : There is no statistically significant difference between the perceptions of Engineering graduates on Anxiety, Perceived Stress Scale and Mental Health in the State of Telangana with special reference to their Group.

Descriptives

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
Anxiety	CSE	67	9.6866	3.07092	.37517	8.9375	10.4356	6.00	18.00
	C.E/DS	7	9.8571	4.01782	1.51859	6.1413	13.5730	6.00	16.00
	AIME	72	11.4583	4.75583	.56048	10.3408	12.5759	6.00	24.00
	IOT	5	13.0000	2.12132	.94868	10.3660	15.6340	11.00	16.00
	Others	19	11.0000	4.24264	.97333	8.9551	13.0449	6.00	21.00
	Total	170	10.6882	4.07799	.31277	10.0708	11.3057	6.00	24.00
Perceived Stress	CSE	67	25.8955	8.22806	1.00522	23.8885	27.9025	10.00	40.00
	C.E/DS	7	23.5714	6.45128	2.43836	17.6050	29.5379	10.00	30.00
	AIME	72	26.0972	8.62548	1.01652	24.0703	28.1241	10.00	50.00
	IOT	5	32.0000	8.30662	3.71484	21.6860	42.3140	24.00	45.00
	Others	19	23.0526	11.05277	2.53568	17.7254	28.3799	10.00	38.00
	Total	170	25.7471	8.72055	.66884	24.4267	27.0674	10.00	50.00
Mental Health	CSE	67	5.6866	4.19310	.51227	4.6638	6.7093	.00	15.00
	C.E/DS	7	4.8571	4.74091	1.79189	.4725	9.2417	1.00	14.00
	AIME	72	5.9028	4.13559	.48738	4.9310	6.8746	.00	15.00
	IOT	5	10.6000	4.27785	1.91311	5.2883	15.9117	5.00	14.00
	Others	19	6.8421	4.85642	1.11414	4.5014	9.1828	.00	14.00
	Total	170	6.0176	4.31246	.33075	5.3647	6.6706	.00	15.00

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ANOVA						
		Sum of Squares	df	Mean Square	F	Sig.
Anxiety	Between Groups	143.326	4	35.832	2.217	.069
	Within Groups	2667.150	165	16.165		
	Total	2810.476	169			
Perceived Stress	Between Groups	376.874	4	94.218	1.246	.293
	Within Groups	12475.250	165	75.608		
	Total	12852.124	169			
Mental Health	Between Groups	135.626	4	33.907	1.860	.120
	Within Groups	3007.321	165	18.226		
	Total	3142.947	169			

To test the hypothesis- '*There is no statistically significant difference between the perceptions of Engineering graduates on Anxiety, Perceived Stress Scale and Mental Health in the State of Telangana with special reference to their Group*.' ANOVA test was performed. The calculated p-value is .069 (Anxiety), .293 (Perceived Stress) and .102 (Mental Health), which is significant at 5% level. The null hypothesis was **accepted.**

HO_2 : There is no statistically significant difference between the perceptions of Engineering graduates on Anxiety, Perceived Stress Scale and Mental Health in the State of Telangana with special reference to their gender.

Group Statistics					
Gender		N	Mean	Std. Deviation	Std.Error Mean
Anxiety	Female	46	10.7609	4.13218	.60926
	Male	124	10.6613	4.07428	.36588
Perceived Stress	Female	46	27.7174	6.62542	.97686
	Male	124	25.0161	9.29724	.83492
Mental Health	Female	46	5.7174	3.90250	.57539
	Male	124	6.1290	4.46480	.40095

		t-test for Equality of Means						
		t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
							Lower	Upper
Anxiety	Equal variances assumed	.141	168	.888	.09958	.70606	-1.29432	1.49348
	Equal variances not assumed	.140	79.527	.889	.09958	.71068	-1.31484	1.51400
Perceived Stress	Equal variances assumed	1.806	168	.073	2.70126	1.49552	-.25116	5.65369
	Equal variances not assumed	2.102	112.747	.038	2.70126	1.28505	.15529	5.24724
Mental Health	Equal variances assumed	-.552	168	.582	-.41164	.74603	-1.88444	1.06116
	Equal variances not assumed	-.587	91.425	.559	-.41164	.70131	-1.80462	.98134

The t-test reveals that the calculated p-value is .889 for anxiety, .073 for perceived stress and .5582 for mental health which is insignificant at 5% level. That means the null hypothesis was **accepted.** It can be inferred that there was no significant difference between the perceptions of Engineering graduates on Anxiety, Perceived Stress Scale and Mental Health in the State of Telangana with special reference to their gender. **HO_3 :**There is no statistically significant difference between the perceptions of Engineering graduates on Anxiety, Perceived Stress Scale and Mental Health in the State of Telangana with special reference to their *Community*

Descriptives

Community		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
Anxiety	OC	96	8.5417	2.97681	.30382	7.9385	9.1448	6.00	19.00
	BC	50	12.3400	3.04798	.43105	11.4738	13.2062	8.00	22.00
	SC	17	15.2353	3.49159	.84683	13.4401	17.0305	10.00	22.00
	ST	7	17.2857	3.72891	1.40940	13.8370	20.7344	13.00	24.00
	Total	170	10.6882	4.07799	.31277	10.0708	11.3057	6.00	24.00
Perceived Stress	OC	96	22.6458	9.08553	.92729	20.8049	24.4867	10.00	41.00
	BC	50	28.8600	6.44920	.91206	27.0272	30.6928	13.00	45.00
	SC	17	31.0000	4.13824	1.00367	28.8723	33.1277	24.00	38.00
	ST	7	33.2857	8.40068	3.17516	25.5164	41.0550	27.00	50.00
	Total	170	25.7471	8.72055	.66884	24.4267	27.0674	10.00	50.00
Mental Health	OC	96	4.5625	4.24218	.43297	3.7030	5.4220	.00	15.00
	BC	50	7.4000	3.44046	.48655	6.4222	8.3778	.00	14.00
	SC	17	9.7059	2.93182	.71107	8.1985	11.2133	4.00	14.00
	ST	7	7.1429	5.42920	2.05204	2.1217	12.1640	.00	14.00
	Total	170	6.0176	4.31246	.33075	5.3647	6.6706	.00	15.00

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
Anxiety	Between Groups	1234.936	3	411.645	43.371	.000
	Within Groups	1575.541	166	9.491		
	Total	2810.476	169			
Perceived Stress	Between Groups	2274.717	3	758.239	11.900	.000
	Within Groups	10577.407	166	63.719		
	Total	12852.124	169			
Mental Health	Between Groups	538.936	3	179.645	11.452	.000
	Within Groups	2604.012	166	15.687		
	Total	3142.947	169			

To test the hypothesis- There is no statistically significant difference between the perceptions of Engineering graduates on Anxiety, Perceived Stress Scale and Mental Health in the State of Telangana with special reference to their *Community* 'ANOVA test was performed. The calculated p-value is 0.000, which is significant at 5% level. The null hypothesis was **rejected.**

MAJOR FINDINGS OF THE STUDY:

1. The results of the study demonstrated that there was no statistically significant difference between the perceptions of Engineering graduates on Anxiety, Perceived Stress Scale and Mental Health in the State of Telangana with special reference to their Group.

2. It was revealed that there was there was no significant difference between the perceptions of Engineering graduates on Anxiety, Perceived Stress Scale and Mental Health in the State of Telangana with special reference to their gender.
3. The findings mirrored that there was a significant difference between the perceptions of Engineering graduates on Anxiety, Perceived Stress Scale and Mental Health in the State of Telangana with special reference to their community.

IMPLICATIONS OF THE STUDY :

The findings of the present study reveals that ***Engineering graduates*** need to develop mental health with regard to anxiety, perceived stress. It was also found that there was a significant difference with special reference to their community. Hence, community development programs are to be organized on a large scale to imbibe a sense of mental health among Engineering graduates. At present students are prone to devote more time for screening their mobiles.so, having a consistent sleeping schedule is more advantageous than obtaining more sleep. Holding on to happy emotions also lead to good mental health.

Professors as well as Colleges of Engineering can play a vital role in identifying and addressing mental health concerns. By being attentive to changes in students' behavior, mood, or academic performance, they can intervene early and provide the necessary support. They can engage in open and non-judgmental conversations, encouraging students to express their concerns and seek help. Through their observations and interactions, teachers can help connect students to appropriate resources and mental health professionals when needed.

The findings also demonstrate that there is a need for the policy makers to implement mental health, including age-appropriate lessons on mental health, coping skills, and stress management.

FUTURE RESEARCH:

This cohort study could not represent the entire population of Engineering Students at the selected college. However, a more extensive sampling might help future research to ensure an in-depth knowledge on mental health. Further, a n empirical study can be conducted to identify the relationship between mental health and other psychological aspects. Moreover, the role of professors in inculcating effective mental health strategies among Engineering students need to be explored.

CONCLUSION :

The study underlined that Mental health can be considered as a very significant aspect of human life. Mental health issues often occur among Engineering students and create negative impact in their academic as well as professional lives.

Every Engineering student is unique national asset and productive leaders of the future. It is the fond hope of the authors that this study will sensitize Engineering graduates in enhancing their mental health in an effective way to meet the 4IR (Fourth Industrial Revolution) demands.

CONFLICT OF INTEREST:

All authors declare that they have no conflicts of interest.

Use of artificial intelligence (AI)-assisted technology for manuscript preparation:

The authors confirm that there was no use of AI-assisted technology for assisting in the writing of the manuscript and no images were manipulated using AI

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