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Assessment of Psychosocial Distress in Medical Students Through Oxidative Stress- A Pilot Study.

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Abstract:
Aim: *To assess the psychosocial stress in medical students (cadre-based) through interview based assessment.*
Methods: *This prospective cross-sectional pilot study was conducted in Jawaharlal Nehru Medical College of Datta Meghe Institute of Medical Sciences (DMIMS) (Grade "A" Accredited by NAAC), Sawangi (Meghe), Wardha. Undergraduate and Postgraduate students of various departments of JNMC were assessed. The subjects were interviewed via a questionnaire, i.e. the Perceived Stress Scale questionnaire (PSS), on the basis of which their stress levels were evaluated. Malondialdehyde (MDA) and Superoxide dismutase (SOD) levels will be assessed in the samples which will indicate the level of oxidative damage. The MDA and SOD levels were compared with the results of the psychosocial stress evaluation test.*
Results: *Average SOD levels in High PSS score in UGs were 1432.82 ± 56.22 U/g Hb **;** and in PGs were 1457.44 ± 34.86 U/g Hb. Average MDA levels in High PSS Score in UGs were 0.72 ± 0.12 µmol/L and in PGs were 0.82 ± 0.06 µmol/L. Average SOD levels in Normal to Low PSS score in UGs were 1382 ± 24.82 U/g Hb and in PGs were 1348 ± 4.54 U/g Hb. Average MDA levels in Normal to Low PSS Score in UGs were 0.44 ± 0.20 µmol/L and in PGs were 0.54 ± 0.16 µmol/L.*
Conclusion:
This pilot study concluded that; there are high stress levels found in medical students. Stress is more in First and Final year students, both undergraduates and postgraduates. Postgraduates have a higher psychological stress values.
Keywords: *Malondialdehyde, MDA, Superoxide dismutase, SOD, PSS*

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I. Introduction

Stress is a commonly used term but has become increasingly difficult to define. It typically describes a negative concept that can have an impact on one's mental and physical well-being. Psychological or psychosocial distress is the stress induced on our mind. It is related to both external and internal factors. External factors include the physical environment; our daily life, job, relationships with others, home, and all the situations, challenges, difficulties and expectations we're confronted with on a day-to-day basis. Internal factors include our overall health, emotional well-being, and the amount of sleep and rest we get.In response to any type of stress, our body responds by the release of hormonal and immunologic factors, which have already been studied in depth. Although such responses can be life-preserving, repeated activation can have a physiologic cost. Presently, there is growing evidence on the effects of psychosocial stress on oxidative stress levels, via activation of NF-kappa B[1]and increase in Homocysteine levels[2,3].

Oxidative stress causes toxic effects through the production of peroxides and free radicals that damage all components of the cell, including proteins, lipids, and DNA. The long term effects of oxidative damage include Heart disease, Cancer, Arthritis, Lung disease, Fibromyalgia, Diabetes mellitus, Neurodegenerative diseases like Parkinson's and Alzheimer's, Autoimmune diseases, Macular degeneration, Chronic Fatigues syndrome, Bipolar disorder and Schizophrenia. Medicine being an emotionally and physically demanding career, stress is equally prevalent among medical practitioners [4, 5] and medical students [6, 7]. Our study focuses on the evaluation of the psychosocial stress induced by various problems on medical professionals and its correlation with the levels of

reactive oxygen species in the blood, which would indicate the extent of oxidative damage caused to the body. It will also establish a biomarker which will ascertain the psychosocial stress in an individual at a given point of time in his/her life.

Aim: To assess the psychosocial stress in medical students (cadre-based) through interview based assessment.
Objectives:

I. To assess the psychological stress in medical students by estimating the oxygen free radical levels in blood.
II. To correlate interview based assessment of psychosocial stress with oxygen free radical levels.

II. Material And Methods

This prospective cross-sectional pilot study was conducted in Jawaharlal Nehru Medical College of Datta Meghe Institute of Medical Sciences (DMIMS) (Grade "A" Accredited by NAAC), Sawangi (Meghe), Wardha. IEC clearance was taken prior to the start of the study.
Duration of study: 6 months

Sample Size:
A sample size of 50 subjects was studied.

Inclusion Criteria:
Undergraduate and Postgraduate students of various departments of Jawaharlal Nehru Medical College.

Exclusion Criteria:
All those who were unwilling to participate in the study, those under any medications and those with known dieseses.

Procedure:

The subjects were interviewed via a questionnaire, i.e. the Perceived Stress Scale (PSS) questionnaire, on the basis of which their stress levels were evaluated. The subjects were asked to fill out the questionnaire during the afternoon, when they were thought to be most stressed out while following their routine. After the interview, a 4 ml blood sample was withdrawn, 2 ml each of which was put in a plane bulb and an EDTA bulb. Malondialdehyde (MDA) and Superoxide dismutase (SOD) levels will be assessed in the samples which will indicate the level of oxidative damage, as higher the levels more will be the damage. The MDA and SOD levels were compared with the results of the psychosocial stress evaluation test. The subjects who had lower levels of psychosocial stress were be used as a baseline and their oxidative free radicals levels were compared with the other subjects to evaluate and grade the level of stress, both psychosocial and oxidative, induced.

Collection, Presentation and Interpretation of data:

The collected data is presented in tabular form and graphs. It was interpreted statistically and analyzed using ANNOVA and 't' test. As per requirement the value of significance was derived.

Observation And Results

Table 1: Distribution of Subjects according to their PSS Score

PSS Score	Undergraduate	Postgraduate
<8	**2**	**0**
8 – 20	**16**	**6**
>20	**17**	**9**

Table 2: Distribution of Subjects according to their SOD levels

		Below Normal Range (<1102 U/g Hb)	Normal Range (1102 – 1601 U/g Hb)	Above Normal Range (>1601 U/g Hb)
UG	First Year	-	9	1
	Second Year	-	8	2
	Third Year	1	13	1

PG	First Year	-	4	1
	Second Year	-	5	-
	Third Year	-	4	1

Table 3: Distribution of Subjects according to their MDA levels

		Below Normal Range (<0.36 µmol/L)	Normal Range (0.36 – 1.24 µmol/L)	Above Normal Range (>1.24 µmol/L)
UG	**First Year**	-	9	1
	Second Year	1	9	-
	Third Year	1	13	1
PG	**First Year**	1	3	1
	Second Year	-	5	-
	Third Year	-	4	1

Table 4: Correlation between PSS Score and SOD levels in UG Students

	PSS Score	Below Normal Range (<1102 U/g Hb)	Normal Range (1102 – 1601 U/g Hb)	Above Normal Range (>1601 U/g Hb)	Total
First Year	<8	-	-	-	0
	8- 20	-	5	-	5
	>20	-	4	1	5
Second Year	<8	-	1	-	1
	8- 20	-	6	-	6
	>20	-	2	1	3
Final Year	<8	-	1	-	1
	8- 20	-	5	-	5
	>20	1	6	2	9
Total		1	30	4	35

Table 4: depicts the PSS Scores and SOD levels in UG students. In all the years high PSS values are associated with normal to high SOD values.

Table 5: Correlation between PSS Score and SOD levels in PG Students

	PSS Score	Below Normal Range (<1102 U/g Hb)	Normal Range (1102 – 1601 U/g Hb)	Above Normal Range (>1601 U/g Hb)	Total
First Year	**<8**	-	-	-	0
	8- 20	-	1	-	1

	>20	-	3	1	4
Second Year	**<8**	-	-	-	0
	8- 20	-	4	-	4
	>20	-	1	-	1

Table 5: depicts the PSS Scores and SOD levels in PG students. In all the years high PSS values are associated with normal to high SOD values.

Table 6: Correlation between PSS Score and MDA levels in UG Students

	PSS Score	**Below Normal Range (<0.36 µmol/L)**	**Normal Range**			**Above Normal Range (>1.24 µmol/L)**	**Total**
			0.36 – 0.60 µmol/L	**0.61 – 0.90 µmol/L**	**0.91 – 1.24 µmol/L**		
First Year	**<8**	-	-	-	-	-	0
	8- 20	-	4	1	-	-	5
	>20	-	1	3	-	1	5
Second Year	**<8**	-	-	1	-	-	1
	8- 20	1	5	-	-	-	6
	>20	-	2	1	-	-	3
Final Year	**<8**	-	1	-	-	-	1
	8- 20	-	4	1	-	-	5
	>20	1	3	3	1	1	9
Total		2	20	10	1	2	35

High PSS Score are associated with normal to high MDA levels. Two of 35 students with high PSS Score have High MDA levels and 1 of 35 student with high PSS Score has high normal MDA levels.

Table 7: Correlation between PSS Score and MDA levels in PG Students

	PSS Score	**Below Normal Range (<0.36 µmol/L)**	**Normal Range**			**Above Normal Range (>1.24 µmol/L)**	**Total**
			0.36 – 0.60 µmol/L	**0.61 – 0.90 µmol/L**	**0.91 – 1.24 µmol/L**		
First Year	**<8**	-	-	-	-	-	0
	8- 20	-	-	1	-	-	1
	>20	-	2	1	-	1	4
Second Year	**<8**	-	-	-	-	-	0

High PSS Score is associated mostly with normal to high MDA levels. Two students with high PSS Score have high MDA levels and 2 with high PSS Score have high normal MDA levels.

III. Discussion

Psychosocial distress is becoming a major cause of psychological morbidity. Not only has it implications on the mental health of a person but also on the physical health via various mechanisms, namely hormonal, immunologic and oxidative. The former two have been studied whereas the oxidative mechanism still needs to be researched.It is a known fact that medical profession is one of the most stressful professions, consisting of both mental as well as physical stress. Many studies have been done which have brought to picture the high stressed associated with medical students as well as practicing doctors.In our study 50 subjects participated of which 35 were undergraduates and 15 were postgraduates. Of the 35 Undergraduates (UGs), 10 students each were from First year and Second year and 15 were from Final year. Of the 15 Postgraduate (PGs) students, 5 were each from First, Second and Final years.

In our study we measured psychological stress via the Perceived Stress Scale (PSS). In both Undergraduates and postgraduates we found normal to high PSS scores in majority.Twenty-six of 50 subjects (52%) had a high PSS score, of which 17 were UGs and 9 were PGs. Of the 17 UGs, 5 (50% of first years) were of first year, 3 (30% of second years) were of second year and 7 (46% of final years) were of final year. Of the 9 PGs, 4 were each of first and final years and 1 of second year.Hence in our study we found that on an average every second medical student, whether a UG or a PG, was stressed out.A .N Supe, [6] J Firth, [7] L N Dyrbye [8] et al and Shashank P Behere [9]et al also found similar high stress levels in medical students. A .N Supe [6]found 73 % students (175 of 238) were stressed out. He found more number of second year and final year students under stress as compared to first year students. In our study higher stress levels were found in first and final year undergraduates.J Firth [7]in his study found that 31.2% students suffered from emotional disturbances.L N Dyrbye[8] et al found that burnout was reported by 49.6% of students and 11.2% reported suicidal ideation.

Shashank P Behere [9]et al found that 2/3rd of the medical students suffered from mental stress.Psychological stress not only affects the mental wellbeing but also affects the human body physically. In our study we tried to correlate Psychological distress with oxidative stress in Medical students. Even though strong correlation was not found, high PSS Scores in both UGs and PGs were associated with a normal to high MDA and SOD levels. Average SOD levels in High PSS score in UGs were 1432.82 ± 56.22 U/g Hb and in PGs were 1457.44 ± 34.86 U/g Hb. Average MDA levels in High PSS Score in UGs were 0.72 ± 0.12 µmol/L and in PGs were 0.82 ± 0.06 µmol/L. Average SOD levels in Normal to Low PSS score in UGs were 1382 ± 24.82 U/g Hb and in PGs were 1348 ± 4.54 U/g Hb. Average MDA levels in Normal to Low PSS Score in UGs were 0.44 ± 0.20 µmol/L and in PGs were 0.54 ± 0.16 µmol/L.

Even though average SOD and MDA levels were within normal range in subjects with high PSS Score they were in the high normal range. And the values of SOD and MDA were higher in subjects with high PSS Score than in low PSS Score. High SOD and MDA levels are associated with high oxidative damage in the body. Although we could not conclusively find a strong correlation between psychosocial distress and oxidative stress in the body, we did find high normal levels of oxidative stress in mentally stressed subjects.M Sivonová et al, [10] Micheal JR etal, [11] in their study found that in stress condition oxidative damage to DNA and sensitivity to lipid oxidation were significantly increased ($p<0.05$) when compared with the same parameters in "non-stress" conditions. A significant decrease in plasma antioxidant activity ($p<0.05$) in students who were under stress was observed. This correlates with our study in the observation that oxidative stress is found in psychological stress.Hence we can say that even though very significant results were not found, it can be concluded still that higher psychological stress correlates with more oxidative stress in the body.

IV. Conclusion

Stress is a commonly used term but has become increasingly difficult to define. It typically describes a negative concept that can have an impact on one's mental and physical well-being. Psychological or psychosocial distress is the stress induced on our mind. It is related to both external and internal factors. Presently, there is growing evidence on the effects of psychosocial stress on oxidative stress levels, via activation of NF-kappa B and increase in Homocysteine levels. Oxidative stress causes toxic effects through the production of peroxides and free radicals that damage all components of the cell, including proteins, lipids, and DNA. Its long term effects are quite dangerous.

This pilot study concluded that; there are high stress levels found in medical students. Stress is more in First and Final year students, both undergraduates and postgraduates. Postgraduates have a higher psychological stress values. High stress values correlate with high or high normal oxidative stress levels in the body. Levels of oxidative stress were found to be higher in postgraduate students. Oxidative stress can be used to predict the psychological stress in the body.

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