A Study of Lifetime Stress on Mental and Physical Health Using Statistical Tools

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Abstract-Advanced technology facilitates the life of human beings. Today wide changes have occurred in life of all people. Emerging new technologies within IT such as the internet and virtual communication networks lead our world to a major challenge that threatens the Physical and mental health of individual. The challenge is the overuse and misuse of the technology. it can be said that: lifestyle has a Significant influence on physical and mental health of human being. malnutrition, unhealthy diet, smoking, alcohol consuming, drug abuse, stress and so on, are the presentation of unhealthy life style which affect more on physical as well as mental health of individual. Although having fascinating lifestyle some people are not satisfied with their life. Living area, profession, economic condition etc. factors affecting the mental and physical health. To study their health and satisfaction Towards Life we preferred systematic questionnaire for data collection. The collected information is analyzed using several statistical tools and techniques. The study reveals that mental health and physical health of people are dependent on each other. Mental health is independent of living area, gender and economic condition.

Keywords: Graphical Representation, Testing of Hypothesis, ANOVA, Level of significance

INTRODUCTION

Mental health determines how you think, feel and act. Good mental health is when you feel positive about yourself and cope well with your everyday pressure. it includes our emotional, psychological and social well-being. good mental health helps to determine how we can handle our stress and make healthy choices.

We should be physically fit likewise we should be mentally very strong. mental health and physical health are equally important components of overall good health for eg. depression increases the risk for many types of physical health problems particularly longlasting conditions like diabetes, heart disease and stroke similarly the presence of chronic conditions can increase the risk for mental health. Therefore good physical health with good mental health is important at every stage of life from childhood and adolescence through adulthood. If we experience issues dealing with everyday problem or we are unable to solve our own problems, it could be a sign of mental health problem. mental illness or disorder can occur over a short period of time or be episodic. This means that mental illness comes and goes with discrete beginnings and ends. People can experience different types of mental problems such as depression, anxiety, fear of failure, eating disorders, suicidal behaviour, Schizophrenia etc.

mental illness can make people miserable and can cause serious problems in our daily life such as at school, House, workplace or in relationships. There are some early warning signs that we should be aware of that can suggest something may be harming your mental health such as mood swings, constantly feeling low or down often, Lack of care for personal responsibilities, increased use of alcohol or drugs, losing interest in things you used to enjoy spending less time with friends and family, feeling irritable, over-sensitive or aggressive. Good mental health with good physical health is very important for having a satisfactory Life But there is considerable stigma attached with mental disorder and ignorance regarding information about mental illness. Mental health

problems at every stage remain unrecognized and untreated. There is tendency to conceal even severe psychiatric problems due to its stigma. By considering all these things we decided to study in this article through feedback measure the satisfactory level of the peoples towards their life. This project is mainly aimed to study Impact of Lifetime stress exposure on mental and physical health of human being and aware them about it. Also to improve health and quality of life for people affected by these conditions. Life stress is strongly associated with poor mental and physical health (Cohen et al., 2007; Slavich et al., 2010). These effects exceed those of other well-known risk factors, such as tobacco use, excessive alcohol consumption, and physical inactivity (Holt-Lunstad et al., 2010), and account for substantial morbidity and mortality (Pedersen et al., 2011). Understanding how stress impacts health, and what factors mitigate these effects, is thus critically important. One of the most important advances in this area of research involves the recent adoption of a life-course perspective for studying stress and health (Graham et al., 2006; Lupien et al., 2009).

OBJECTIVES

To study gender wise mental health and physical health.

- To study Age wise mental health and physical health.
- To check the independency between education and mental health.
- To identify significance difference between mental health and physical health.
- To examine relationship between household Income and mental health or household income and physical health.
- To find out which factors affected on mental health and physical health.
- To study area wise mental health and physical health.

METHODOLOGY

For this project primary data was collected with the help of survey technique through questionnaire. Data is collected from rural and urban areas of Kolhapur district sampling method used here is SRSWOR. The questionnaire were filled by 200 respondents. Personal observation and questionnaire technique was used.

STATISTICAL SOFTWARE

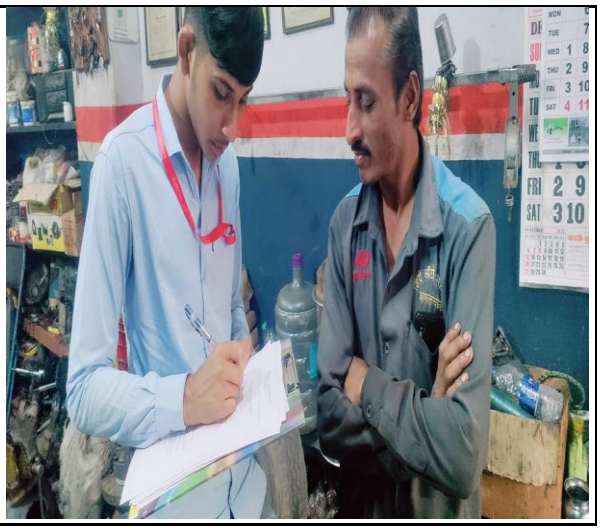
- MS-Excel
- MS-Word
- R-Software

STATISTICAL TOOLS

- Graphical Tools:- Bar diagram, Multiple Bar diagram, Pie chart.
- Test:- Chi-Square Test, Kruskal Wallis Test, Shapiro Test.
- Non Parametric Test:- Mann-Whitney U Test, Run test.
- Other Statistical Methods :- ANOVA

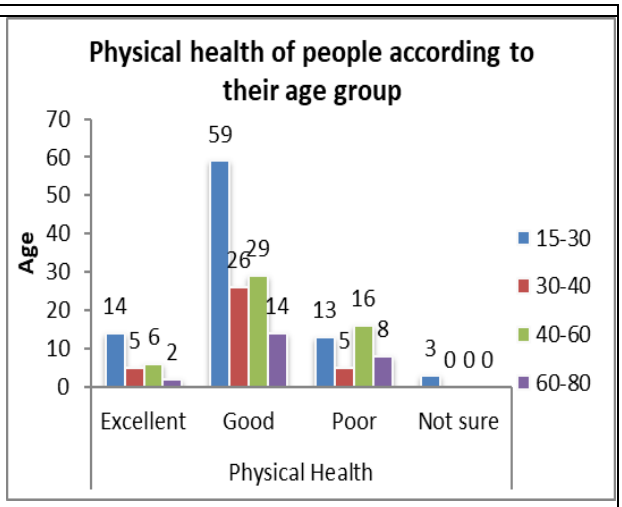
METHODS OF DATA COLLECTION

For this study we have collected primary data from 200 people of different age groups from rural and urban areas of Kolhapur district.

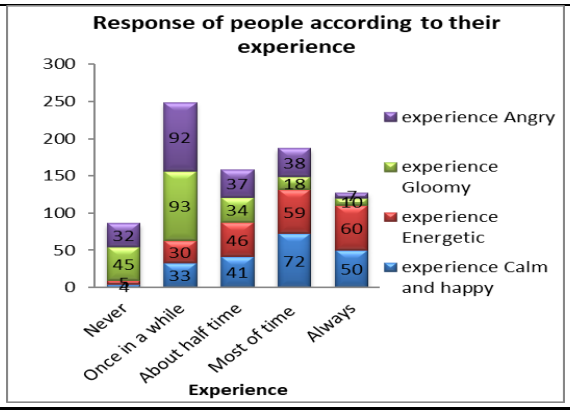


Graphical Representation:

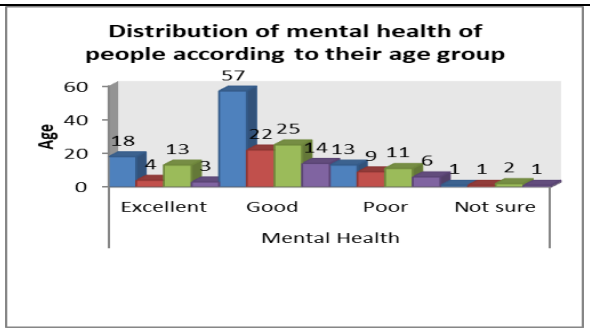
Age	Physical Health				
	Excellent	Good	Poor	Not sure	Total
15-30	14	59	13	3	89
30-40	5	26	5	0	36
40-60	6	29	16	0	51
60-80	2	14	8	0	24
Total	27	128	42	3	200



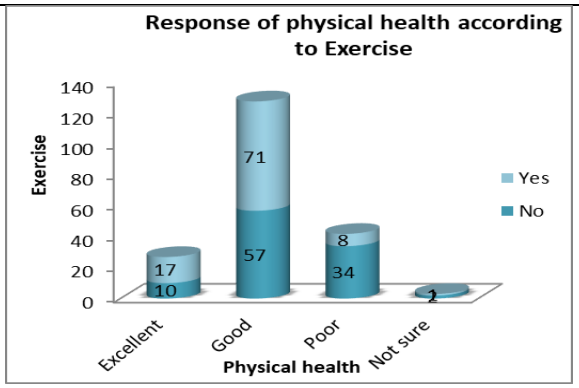
	experience			
	Calm and happy	Energetic	Gloomy	Angry
Never	4	5	45	32
Once in a while	33	30	93	92
About half time	41	46	34	37
Most of time	72	59	18	38
Always	50	60	10	7



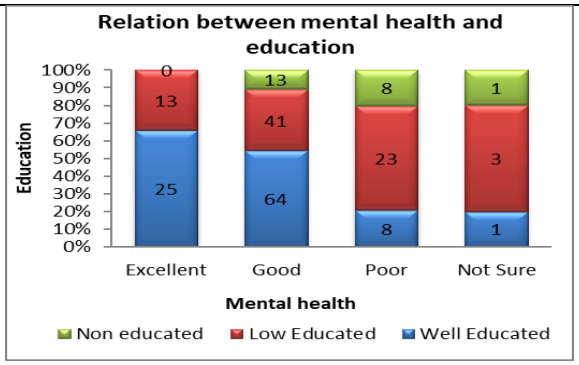
Age	Mental Health				
	Excellent	Good	Poor	Not sure	Total
15-30	18	57	13	1	89
30-40	4	22	9	1	36
40-60	13	25	11	2	51
60-80	3	14	6	1	24
Total	38	118	39	5	200



Exercise	Physical Health				
	Excellent	Good	Poor	Not sure	Total
No	10	57	34	2	117
Yes	17	71	8	1	83
Total	27	128	42	3	200



Education	Mental Health				
	Excellent	Good	Poor	Not Sure	Total
Well Educated	25	64	8	1	98
Low Educated	13	41	23	3	80
Non educated	0	13	8	1	22
Total	38	118	39	5	200



Testing Part:

a) Test for independence between Age and Mental health.

Hypothesis

H_0 : There is independence between age and mental health.

H_1 : There is dependence between age and mental health.

Level of significance $\alpha = 0.05$

$\chi^2 = 7.6877$, df = 9, p-value = 0.5659 Since , p-value >0.05

b) Test for independence between Education and Mental health.

Hypothesis

H_0 : There is independence between education and mental health.

H_1 : There is dependence between education and mental health.

Level of significance $\alpha = 0.05$

$\chi^2 = 23.064$, df = 6, p-value = 0.0007755 Since , p-value <0.05

c) Test for independence between Economic condition and Mental health.

Hypothesis

H_0 : There is independence between Economic condition and mental health.

H_1 : There is dependence between Economic condition and mental health.

Level of significance $\alpha = 0.05$

$\chi^2 = 10.058$, df = 6, p-value = 0.1222 Since , p-value >0.05

d) Test for independence between Good relationship and Mental health.

Hypothesis

H_0 : There is independence between Good relationship and mental health.

H_1 : There is dependence between Good relationship and mental health.

Level of significance $\alpha = 0.05$

$\chi^2 = 15.861$, df = 6, p-value = 0.01452 Since , p-value <0.05

e) Test for independence between Physical health and Mental health.

Hypothesis

H_0 : There is independence between Physical health and mental health.

H_1 : There is dependence between physical health and mental health.

Level of significance $\alpha = 0.05$

$\chi^2 = 109.09$, df = 9, p-value <2.2e-16 Since , p-value <0.05

f) Test for independence between daily Exercise and Mental Health.

Hypothesis

H_0 : There is independence between daily exercise and mental health.

H_1 : There is dependence between daily exercise and mental health .

Level of significance $\alpha = 0.05$

$\chi^2 = 16.174$, df = 3, p-value = 0.001044Since , p-value <0.05

g) Test for independence between suicidal behaviour and Mental Disorder.

Hypothesis

H_0 : There is independence between suicidal behaviour and mental disorder.

H_1 : There is dependence between suicidal behaviour and mental disorder.

Level of significance $\alpha = 0.05$

$\chi^2 = 18.472$, df = 4, p-value = 0.0009978 Since , p-value <0.05

h) To compare the analysis of variance of mental health and physical health of people using krushal wallis test.

Testing the Hypothesis

H_0 : The mean ranks of group are same. V]s H_1 : The mean ranks of group are not same.

Observation table :

Physical Health	Mental Health				
	Excellent	Good	Poor	Not sure	Total
Excellent	19	8	0	0	27
Good	18	91	15	4	128
Poor	1	17	24	0	42
Not sure	0	2	0	1	3
Total	38	118	39	5	200

Test statistics:

$H = \frac{12}{n(n+1)} * \Sigma \frac{T_i^2}{n_i} - 3(n+1)$

$\Sigma \frac{T_i^2}{n_i} = 1210.875$

$H = \frac{12}{11(11+1)} * (1210.875) - 3(11+1)$

$= (0.09090)*(1210.875) - 36$

$= 110.0685 - 36 = 74.0685$

At 5% level of significance and with 3 degree of freedom , chi- square tabulated value is,

$\chi^2_{\text{tab.}} = \chi^2_{(4-1)\,5\%} = \chi^2_{3,0.05}$

$\chi^2_{\text{tab.}} = 7.815$ Since, $H > \chi^2_{\text{tab}}$

i) To compare the analysis of variance of mental health and age of people using kruskal wallis test.

Testing the Hypothesis

H_0 : The mean ranks of group are same.v\s H_1 : The mean ranks of group are not same.

Observation table :

Age	Mental Health				
	Excellent	Good	Poor	Not sure	Total
15-30	18	57	13	1	89
30-40	4	22	9	1	36
40-60	13	25	11	2	51
60-80	3	14	6	1	24
Total	38	118	39	5	200

Test statistics:

H = $\frac{12}{n(n+1)} * \Sigma \frac{T_i^2}{n_i}$ - 3(n+1) and $\Sigma \frac{T_i^2}{n_i}$= 1449.625

H = $\frac{12}{11(11+1)}$ * (1210.875)

= 0.06593*1449.625-42

=95.5737-42

=53.5737

At 5% level of significance and with 3 degree of freedom , chi- square tabulated value is,

χ^2 tab. = χ^2(4-1) 5% = χ^2 3,0.05

χ^2 tab.= 7.815 Since, H > χ^2 tab

j) To compare the mental health of people from rural and urban area by using Mann whitney U test.

Ho: F(x)=F(y) i.e. mental health of people in rural and urban areas come from same population.

H1: F(x)≠F(y) i.e. mental health of people in rural and urban areas come from different population.

Rural	24	55	18	1
Urban	14	63	21	4

Observation table:

Sr. no	Ascending order	Rank	Rank(Rural)	Rank(Urban)
1	1	1	1	
2	4	2		2
3	14	3		3
4	18	4	4	
5	21	5		5
6	24	6	6	
7	55	7	7	
8	63	8		8
			ΣR1=18	ΣR2=18

Test Statistics:

$U_1=n_1n_2+\frac{n1(n1+1)}{2}$ - R_1 and

$U_2=n_1n_2+\frac{n2(n2+1)}{2}$ - R_2

Where,

n_1 = no. of observation in the first sample.,n_2 = no. of observation in the second sample.

R_1= sum of rank of first sample. ,R_2= sum of rank of second sample.

Here,n_1 = 4, n_2 = 4, R_1 = 18, R_2= 18 now,

$U_1= n_1n_2+\frac{n1(n1+1)}{2}$ - R_1 and

U_1= 4*4+$\frac{4(4+1)}{2}$ - 18 = 8 and

$U_2=n_1n_2+\frac{n2(n2+1)}{2}$ - R_2

U_2=4*4 + $\frac{4(4+1)}{2}$ – 18 = 8

Calculated Value of Test Statistics is:

U=min{ U_1, U_2} =min{8,8} = 8

Critical value,

for α = 5% level of significance $U_{n1n2}\alpha/2 = U_{4*4}$

0.025= 0 Since, U > $U_{n1n2}\alpha/2$

h)To compare the mental health of male and female By using Mann-Whitney U test.

Ho: F(x)=F(y) i.e. mental health of male and female come from same population.

H_1: F(x)≠F(y) i.e. mental health of male and female come from different population

Male	29	65	16	2
Female	9	53	23	3

Observation table:

Sr. no	Arrange ascending order	Rank	Rank(Mal e)	Rank(Femal e)
1	2	1	1	0
2	3	2	0	2
3	9	3	0	3
4	16	4	4	0
5	23	5	0	5
6	29	6	6	0
7	53	7	0	7
8	65	8	8	0

Test Statistics:

$U_1=n_1n_2+\frac{n1(n1+1)}{2}$ - R_1 and $U_2=n_1n_2+\frac{n2(n2+1)}{2}$ - R_2

Where, n_1 = no. of observation in the first sample,n_2 = no. of observation in the second sample.

R_1= sum of rank of first sample, R_2= sum of rank of second sample.

Here, $n_1 = 4$, $n_2 = 4$, $R_1 = 19$, $R_2 = 17$now,

$U_1=n_1n_2+\frac{n1(n1+1)}{2}$ - R_1

$U_1 = 4*4+\frac{4(4+1)}{2}$ - 19 = 7 and $U_2 =n_1n_2+\frac{n2(n2+1)}{2}$ - R_2

$U_2 = 4*4 + \frac{4(4+1)}{2} - 17 \quad \therefore U_2 = 9$

$U = \min\{ U_1, U_2 \} = \min\{7,9\} = 7$

Calculated Value of Test Statistics is:

Critical value, for $\alpha = 5\%$ level of significance

$U_{n1n2}\alpha/2 = U_{4*4}\ 0.025 = 0$ Since, $U > U_{n1n2}\alpha/2$

i)Run test

Hypothesis :

H_0 : Sample is random. V/S H_1 : Sample is not random.

Observations

FMMMFMMMMFF FFM FFMMMMFFFFFFF MFFM FMFMFFF MMM FFM FMMFF MFMFFF MFMMFF MMFMMM MMFMMMFF MM F FFMMM FFF MFFFF MM FFM FFF MEMMNMF F F F M F M M FM M M FM M M M M M MMMMMMF M M M M F F F M M M FMMMF MMM FMMMMMMMM FMF FMMMFFFM FF MM M MMMFFFF M F M F M M MF FM MMFMMFF

Notations

n =sample size=200 ,r=number of runs=89, n1= number of female=88, n2=number of male=112

Calculation:

$E(r) = \frac{n+2}{2} = \frac{200+2}{2} = 101$ and $V(r) = \frac{n(n-2)}{4(n-1)} = \frac{200(200-2)}{4(200-1)} = 49.7487$

Test statistics:

$|Z| = |\frac{r-E(r)}{\sqrt{v(r)}}| \sim N(0,1) = |\frac{89-101}{\sqrt{49.7487}}| = 1.7012$

$Z_{tab} = Z_{\alpha/2} = 1.96 \quad |Z| < Z_{\alpha/2}$

Overall Conclusion:

- There is independency between area and mental health of people.
- Physical health and mental health are independent ofgender.
- Physical health and mental health are dependent on each other.
- There is significant difference in physical and mental health of people.
- Mental health is not depends upon economic condition.
- There is slight dependency of mental and physical health of people on their education.
- Mental health and physical health are affected by any problem in life.
- Daily exercise helps to maintain good physical as well as mental health.
- There is dependency of mental health on having good relationships.
- Male and female samples are randomly taken.
- Most people having medium economic condition are satisfied with their life.

REFERENCE

1. Cohen S, Janicki-Deverts D, Miller GE. Psychological stress and disease. Journal of the American Medical Association. 2007; 298(14):1685–1687.
2. .Slavich GM, O'Donovan A, Epel ES, et al. Black sheep get the blues: A psychobiological model of social rejection and depression. Neuroscience and Biobehavioral Reviews. 2010; 35(1):39–45.
3. Holt-Lunstad J, Smith TB, Layton JB. Social relationships and mortality risk: A meta-analytic review. PLoS Medicine. 2010; 7(7):e1000316.
4. Pedersen, AF.; Bovbjerg, DH.; Zachariae, R. Stress and susceptibility to infectious disease. In: Contrada, RJ.; Baum, A., editors. The Handbook of Stress Science: Biology, Psychology, and Health. New York: Springer; 2011. p. 425-445
5. Graham JE, Christian LM, Kiecolt-Glaser JK. Stress, age, and immune function: Toward a lifespan approach. Journal of Behavioral Medicine. 2006; 29(4):389–400.
6. Lupien SJ, McEwen BS, Gunnar MR, et al. Effects of stress throughout the lifespan on the brain, behaviour and cognition. Nature Reviews Neuroscience. 2009; 10(6):434–445.