ORIGINAL ARTICLE

SLEEP QUALITY AMONG TYPE 2 DIABETICS WITH NICOTINE DEPENDENCE

Sivaraman S[1], Aarthi R[2], Ismail M[3], Thirumala Kolundu Subramanian P[4]

ABSTRACT: INTRODUCTION: Sleep disorders are reported due to varied reasons and are on the rise. Diabetes is established as the one of the reasons for alterations in the quality of sleep. Studies have established that nicotine acts on the neurotransmitter system and influence the quality of sleep. Nicotine use by the diabetic patients is an added factor and will interfere with their quality of sleep. The objectives of the study were to assess the quality of sleep among uncontrolled and uncomplicated type 2 diabetics with and without nicotine dependence and to find out the effect of nicotine in the day time functioning of the study population. **MATERIALS AND METHODS:** This study was carried out in a tertiary care teaching hospital among 50 individuals without Nicotine dependence and 50 individuals with Nicotine dependence of uncontrolled and uncomplicated known type 2 Diabetes mellitus. A pretested questionnaire, Fagerstrom test form for Nicotine dependence for smokers, the Pittsburg Sleep Quality Index and Epworth Sleepiness Scale were used to collect data from the study subjects in order to assess the quality of sleep among the study group. **RESULTS:** The sleep quality among the smokers was different in terms of time of going to bed, time to sleep, hours of sleep, time taken to fall asleep, waking up in the middle of sleep, breathing problem, pain in the leg, and afternoon nap and cough or snore during sleep [p<0.05]. Whereas no significance was noticed in getting up early in the morning [p>0.05]. In this study, 92% of the smokers belonged to the low to moderate dependence category as per the Fagerstrom test. **DISCUSSION:** The sleep quality of low and moderate nicotine dependent type 2 diabetics differed significantly from the non-nicotine users. Most of the study population belonged to low to moderate nicotine dependence [92%]. Health education and enforcement on prevention of smoking in public places is found to have an effect on the Nicotine use in Tamil Nadu.
KEYWORKS: Sleep Quality, Fagerstrom test, Pittsburg Sleep Quality Index, Epworth Sleepiness Scale.

INTRODUCTION: A good sleep is considered as an essential component of the biological processes of the body for all human beings. Inadequate sleep is found to have an impact on learning, memory processing, cellular repair, brain development and proper functioning of the human systems.[1-4]

On the other hand adequate sleep habits have positive role on the neurobehavioral performance. Sleep disorder has a direct impact on the functioning of all body organs and systems.[5] Several studies have proved the poor level of sleep to increase the mortality among individuals.

Sleep below optimal level will cause neurobehavioral deficits, impaired attention, slowed down working memory, cognitive thought and depression, lessening concentration which leads to accidents or even death.[6]

Among the non-communicable diseases, diabetes is considered as a major cause of death and disability in the world today. According to the WHO fact sheet 347 million people suffer from diabetes and more than 80% of deaths occur due to diabetes among the lower and middle income category.[7] In the South East Asian region nearly 71 million people are suffering from diabetes and 1 million deaths

ORIGINAL ARTICLE

occur every year. Diabetes mellitus once considered as a mild disorder of the aged persons, now has become the major issue among the non-communicable disease burden in the world as well as in India.

A study conducted by Indian Council of Medical Research in 1972-75 showed that the prevalence of diabetes was 2.1% in urban and 1.5 in rural population. Now diabetes has emerged as an epidemic in nature worldwide including India. Further studies during 1988 revealed a rising trend of diabetes in India. A recent study published by the Indian Council of Medical Research in 2011 shows that 10.4% and 8.3 % of the population are in the diabetic and pre diabetic state respectively in Tamil Nadu, which accounts for 4.8 million diabetes and 3.9 million people with pre diabetes.

Diabetes is considered as one of the reasons for sleep disorder and sleep disorder in turn affects the blood glucose levels. Diabetic patients frequently complained of sleeplessness, excessive daytime sleepiness and unpleasant sensation in the leg.

Nicotine use has been associated with a range of sleep disorders, including shorter sleep duration, difficulty in initiating and maintaining sleep[8], snoring and daytime sleepiness[9]. Previous cross-sectional studies have reported an association between active Nicotine use and insufficient rest/sleep.[10]

The objectives of the study were to assess the quality of sleep among uncontrolled and uncomplicated type 2 diabetics with and without nicotine dependence and to find out the effect of nicotine use in the day time functioning of the study population among diabetic patients attending a tertiary care teaching hospital in Tamil Nadu, India.

MATERIALS AND METHODS:
STUDY SITE: This cross sectional observational study was carried out in the Department of Psychiatry in collaboration with the Department of Medicine of a tertiary care teaching hospital located in a rural area of Trichy District, Tamil Nadu, India. Between the months of May and October 2013.

SAMPLE COLLECTION: The subjects who were included in this study were known diabetic patients free from any overt complication of type 2 Diabetes Mellitus, fifty patients with Nicotine Dependence and fifty patients without Nicotine dependence who attended the Diabetic review Outpatient Department (OPD). Subjects were taken up for this study by the convenience sampling method. All male subjects aged between 25 and 65 years were included in this study.

Inclusion Criteria: Only male members were selected for this study since female smokers are extremely rare in our region.

Exclusion Criteria: People aged more than 65 years, those with severe medical illness, those who did not give the consent, those on sleep medications and those who use other psychoactive substances in a dependent manner were excluded from the study.

Institutional Ethics Committee Clearance: The study was approved by the Institutional Ethics Committee and informed consent was obtained from each individual.

ORIGINAL ARTICLE

Method of Study: A semi structured pretested questionnaire was used to assess the Sociodemographic profile, Anthropometric measures, information on diabetes status and control. The Pittsburg Sleep Quality Index (PSQI) was used to assess the quality of sleep[11] and the impact of sleeplessness on daytime functioning was assessed with The Epworth sleepiness scale (ESS).[13] Nicotine dependence was assessed with the Fagerstrom test.[14]

The instruments used to find out the difference between smokers and non-smokers of the type 2 diabetics are all scalable measurements. Non-parametric Moses test was performed to find out the significance level of the two groups considering non-smokers as a control group and smokers as the experimental group. Observations of nonsmokers and smokers are combined, grouped and then ranked for analysis. The data were analyzed by computing the data in the SPSS version 21 software.

RESULTS: Descriptive statistics for the variables of sociodemographic data are presented in Table 1. In this study group, all the subjects were males and the mean age ± standard deviation of the smokers and non-smokers were 52.28 ± 9.154 years (34-65) and 50.08 ± 9.223 years (28-65) respectively. Most of them belonged to the rural setup- 58% of the smokers and 70 % of the nonsmokers. The mean ± SD for body mass index of smokers and nonsmokers was 23.434± 4.12 Kg/m² (15.11-34.19) and 24.394± 2.87 Kg/m² (15.4-29.67) respectively.

The duration of diabetes of smokers and nonsmokers ranged from 0 to 936 and from 0-1716 respectively, and it had a mean and SD of 203.21 ± 251.05and 184.84 ±268.47. 86% of the smokers and 90% of nonsmokers were on anti-diabetic measures out of which about two thirds were on oral hypoglycemic drugs. About 46% of the subjects followed regular aerobic exercises along with a diabetic diet.

SL. No.	Variable	Smokers		Non Smokers		
		Mean	Standard Deviation	Mean	Standard Deviation	P value
1.	Age (yrs.)	52.28	±9.15	50.08	±9.223	0.298
2.	Height (cms)	162.17	±6.58	162.79	±6.43	0.634
3.	Weight (Kgs)	61.74	±11.80	64.84	±9.71	0.155
4.	BMI (Kg/m²)	23.43	±4.12	24.39	±2.87	0.122
6.	Fasting Blood Glucose (mg/dl)	185.81	±96.06	196.9	±113.12	0.890
7.	Post Prandial Blood Glucose (mg/dl)	266.67	±126.41	288.67	±130.88	0.392
8.	Duration of diabetes (in weeks)	203.21	±251.05	184.84	±268.47	0.593
	Table 1: Sociodemographic and clinical data of Smokers and Non Smokers					

Sociodemographic and clinical data of smokers and non- smokers did not vary significantly [p >0.05]. Descriptive statistics for the variables of the Fagerstrom test for Nicotine dependence are presented in Table 2. About 92% of the diabetic smokers in this study belonged to low to moderate levels of nicotine dependence category (low-38%, low to moderate-18%, moderate-36% and high-8%) using the Fagerstrom test for nicotine dependence and only 8% of them belonged to the high dependence category.

ORIGINAL ARTICLE

		N(%)
How soon after waking do you smoke your first Cigarette?	Within 5 minutes 5-30 minutes 31-60 minutes	19 (38) 12(24) 19(38)
Do you find it difficult to refrain from smoking in places where it is forbidden? e.g. Church, Library, etc.	Yes No	14(28) 36(72)
Which cigarette would you hate to give up?	The first in the morning Any other	19(38) 31(62)
How many cigarettes a day do you smoke?	10 or less 11-20 21-30 31 or more	30(60) 11(22) 4(8) 5(10)
Do you smoke more frequently in the morning?	Yes No	12 (24) 38 (76)
Do you smoke even if you are sick in bed most of the Day?	Yes No	27(46) 23(54)
TOTAL SCORE	1-2= low dependence:(19)38% 5-7=moderate dependence: (18)36% 3-4=low to moderate dependence:(9)18% 8+=high dependence: (4)8%	

Table 2: Fagerstrom Test for Nicotine Dependence of Smokers

Descriptive statistics for the variables of the Pittsburg Sleep Quality Index are presented in table 3. Based on the Pittsburg Sleep Quality Index (PSQI) to assess the sleep quality of the diabetic smokers and nonsmokers, the Non nicotine dependent diabetic populations were better sleepers by 2% than the Nicotine dependent diabetic population. However, smokers were found to have increased complaints of coughing and snoring that disturbs their sleep significantly when compared to the non-smokers ($p <0.05$).

SL. No.	Behavior	Parameters	Smokers n=50 Non-smokers n=50		
			Smokers n (%)	Non-smokers n (%)	Moses test: observed group span-Sig [1-Tailed] p value
1.	Gone to bed				
		Before 10 p.m.	29(58)	41(82)	0.015
		After 10 p.m.	21(42)	9(18)	
2.	Time to sleep (in min)	≤15	17(34)	15(30)	
		16-30	15(30)	19(38)	
		31-60	10(20)	12(24)	0.000
		>60	8(16)	4(8)	
3.	Getting up in the morning	3-4:30 a.m.	10(20)	11(22)	
		4:31-5:30 a.m.	19(38)	17(34)	0.309
		>5:30 a.m.	21(42)	22(44)	
4.	Hours of sleep	<5	13(18)	16(10)	
		5-6	18(20)	15(28)	
		6-7	10(36)	14(30)	0.002
		>7	9(26)	5(32)	
5.	Cannot get to sleep within 30 minutes	Not during the past month	13(26)	14(28)	

ORIGINAL ARTICLE

		Less than once a week	9(18)	10(20)	0.000
		Once or twice a week	9(18)	5(10)	
		Three or more times a week	19(38)	21(42)	
6.	Wake up in the middle of the night or early morning	Not during the past month	4(8)	5(10)	0.000
		Less than once a week	2(4)	2(4)	
		Once or twice a week	6(12)	4(8)	
		Three or more times a week	38(76)	39(78)	
7.	Have to get up to use the bathroom	Not during the past month	6(12)	4(8)	0.000
		Less than once a week	2(4)	2(4)	
		Once or twice a week	4(8)	4(8)	
		Three or more times a week	38(76)	40(80)	
8.	Cannot breathe comfortably	Not during the past month	45(90)	46(92)	0.000
		Less than once a week	0(0)	2(4)	
		Once or twice a week	2(4)	2(4)	
		Three or more times a week	3(6)	0(0)	
9.	Cough or snore loudly	Not during the past month	39(78)	47(94)	0.000
		Less than once a week	3(6)	2(4)	
		Once or twice a week	4(8)	1(2)	
		Three or more times a week	4(8)	0(0)	
10.	Feel too cold	Not during the past month	46(92)	42(84)	0.000
		Less than once a week	3(6)	4(8)	
		Once or twice a week	1(2)	4(8)	
		Three or more times a week	0(0)	0(0)	
11.	Feel too hot	Not during the past month	47(94)	50(100)	0.000
		Less than once a week	1(2)	0(0)	
		Once or twice a week	2(4)	0(0)	

ORIGINAL ARTICLE

		Three or more times a week	0(0)	0(0)	
12.	Have bad dreams	Not during the past month	36(72)	36(72)	0.000
		Less than once a week	6(12)	6(12)	
		Once or twice a week	4(8)	6(12)	
		Three or more times a week	4(8)	2(4)	
13.	Have pain	Not during the past month	26(52)	25(50)	0.000
		Less than once a week	7(14)	6(12)	
		Once or twice a week	6(12)	8(16)	
		Three or more times a week	11(22)	11(22)	
14.	Other restlessness while you sleep, describe.	Not during the past month	42(84)	44(88)	0.000
		Less than once a week	2(4)	4(8)	
		Once or twice a week	1(2)	1(2)	
		Three or more times a week	5(10)	1(2)	
15.	Trouble staying awake while driving, eating meals, or engaging in social activity	Not during the past month	13(26)	16(32)	0.000
		Less than once a week	24(48)	22(44)	
		Once or twice a week	12(24)	11(22)	
		Three or more times a week	1(2)	1(2)	
16.	Problem to keep up enthusiasm to get things done	Not during the past month	11(22)	14(28)	0.000
		Less than once a week	21(42)	18(36)	
		Once or twice a week	16(32)	15(30)	
		Three or more times a week	2(4)	3(6)	
17.	Overall subjective sleep rating	Very good	6(12)	2(4)	0.008
		Fairly good	20(40)	27(54)	
		Fairly bad	19(38)	13(26)	
		Very bad	5(10)	8(16)	
18.	Global PSQI score	<5 (good sleepers)	13(26)	14(28)	0.000
		≥5 (poor sleepers)	37(74)	36(72)	
Table 3: Pittsburg Sleep Quality Index for smokers and non-smokers.					

ORIGINAL ARTICLE

Descriptive statistics for the variables of Epworth Sleepiness Scale and the comparison of the daytime functioning between the two groups is presented in table 4. Based on the Epworth Sleepiness Scale indicator (ESS) to assess the level of daytime functioning in the study population, the diabetic non-smokers had better daytime functioning by 4% when compared to the diabetic smokers. But the excessive day time sleepiness was found to be higher level among Smokers [56%] than non-smokers [32%].

SL. No.	Situation	Chance of dozing	Smokers (%)	Non-smokers n (%)	Moses test: observed group span-Sig [1-Tailed] p value
1.	Sitting and Reading	Would never doze	27(54)	32(64)	0.000
		Slight chance of dozing	6(12)	7(14)	
		Moderate chance of dozing	15(30)	9(18)	
		High chance of dozing	2(4)	2(4)	
2.	Watching TV	Would never doze	28(56)	31(62)	0.000
		Slight chance of dozing	8(16)	5(10)	
		Moderate chance of dozing	10(20)	13(26)	
		High chance of dozing	4(8)	1(2)	
3.	Sitting inactive in a public place	Would never doze	9(18)	10(20)	0.001
		Slight chance of dozing	40(80)	34(68)	
		Moderate chance of dozing	1(2)	6(12)	
		High chance of dozing	0(0)	0(0)	
4.	As a car passenger for an hour without a break	Would never doze	9(18)	12(24)	0.000
		Slight chance of dozing	4(8)	9(18)	
		Moderate chance of dozing	14(28)	11(22)	
		High chance of dozing	23(46)	18(36)	
5.	Lying down to rest in the afternoon when circumstances permit	Would never doze	3(6)	3(6)	0.056
		Slight chance of dozing	15(30)	16(32)	
		Moderate chance of dozing	25(50)	29(58)	
		High chance of dozing	7(14)	2(4)	
6.	Sitting and talking to	Would never	45(90)	46(92)	

ORIGINAL ARTICLE

	someone	doze			0.000
		Slight chance of dozing	3(6)	4(8)	
		Moderate chance of dozing	2(4)	0(0)	
		High chance of dozing	0(0)	0(0)	
7.	Sitting quietly after lunch without alcohol	Would never doze	5(10)	7(14)	0.000
		Slight chance of dozing	3(6)	2(4)	
		Moderate chance of dozing	9(18)	11(22)	
		High chance of dozing	33(66)	30(60)	
8.	In a car while stopped for a few minutes in the traffic	Would never doze	7(14)	8(16)	0.004
		Slight chance of dozing	26(32)	25(50)	
		Moderate chance of dozing	11(22)	16(32)	
		High chance of dozing	6(12)	1(2)	
9.	ESS Total Score	0-4	1(2)	3(6)	0.102
		5-9	21(42)	21(42)	
		>10	28(56)	26(32)	
10.	ESS Score indicator	Satisfactory daytime functioning	1(2)	3(6)	0.000
		Daytime tiredness, lack of energy	21(42)	21(42)	
		Excessive daytime sleepiness	28(56)	26(32)	
Table 4: Epworth Sleepiness Scale for smokers and non- smokers					

The PSQI parameters are computed and analyzed by Non Parametric Moses test.[15] The behavioral pattern of smokers and Nonsmokers was found not to be significant in getting up in the morning only [p>0.05] but highly significant in all other behavioral patterns [p<0.05]. When the Epworth Sleepiness Scale was computed and analyzed by Moses test, lying down to rest in the afternoon when circumstances permit alone was not statistically significant [p >0.05] and all other parameters were found significant [p<0.05]. The significance level of both non-smokers and smokers are tabulated in Tables 3 and 4.

DISCUSSION: Factors affecting the quality of life of people with Diabetes Mellitus are varied. One among which is the disturbances in their sleep pattern. There is evidence to show sleep disorders such as OSA, insomnia, short or long-term sleep duration and restless legs syndrome are potential risk factors for insulin resistance, glucose intolerance, type 2 diabetes mellitus and metabolic

ORIGINAL ARTICLE

syndrome.[16] A significant proportion of Type 2 diabetics have reduced sleep and there is a definite association between glycemic control and both quality and quantity of sleep.[17]

Nicotine use among diabetics might further affect their quality of life.

But in the present study in which the sociodemographic profile of the two groups is comparable, the sleep pattern and the level of daytime functioning between the nicotine dependent diabetic group and the nicotine non-dependent diabetic group differs significantly in the time of going to bed, time to sleep, hours of sleep, time taken to fall asleep, waking up in the middle of sleep, breathing problem, pain in the leg, and afternoon nap and cough or snore [$p < 0.05$].

Whereas no significance is noticed in getting up early in the morning [$p > 0.05$]. In this study, 92% of the smokers belonged to the low to moderate dependence category as per the Fagerstrom test. And the reason for the low level of nicotine dependence in the study population may be due to the awareness among the people about the ill effects of smoking and the legislative measures that had decreased the levels of smoking by reducing the production of tobacco, the sale of tobacco products and by prohibiting smoking in public places.

A study conducted by Osme et al also revealed that there was no significant difference in the proportion of individuals with symptoms of anxiety ($p = 0.072$) or depression ($p = 0.657$) in Diabetic Smokers when compared to the Diabetic non-smokers or the non-diabetic smokers and also the Fagerström scores showed no significant correlation with the scores obtained on the subscale of anxiety ($p = 0.735$) or depression ($p = 0.364$). The prevalence of depression and anxiety among smokers with and without diabetes and non-smokers Type 2 Diabetes mellitus is similar.

The presence of symptoms of anxiety or depression is similar between patients who are dependent and not dependent on nicotine [18]. But Breslau et al demonstrated in young adults positive associations between nicotine dependence and major depression, obsessive compulsive type disorders, phobias, and anxiety disorders, as well as alcohol and illicit drug use.[19]

The current study is likely to be the first study to report about the sleep pattern and its impact on daytime functioning between the diabetic smokers and the diabetic non-smokers. Since the population in this study is small, Moses test was employed to find out the significance level of parameters among two groups

LIMITATIONS: This study was conducted in a single area and is a single centered study. Males alone included as smoking behavior present in males alone in the study area.

CONCLUSION:
1. On comparing the diabetic smokers and the diabetic nonsmokers at the time of going to bed, time to sleep, hours of sleep, time taken to fall sleep, waking in the middle of sleep, breathing problem, pain in the leg and afternoon nap and cough or snore they differ significantly [$p < 0.05$].
2. Other components of Pittsburg Sleep Quality Index (PSQI) assessing the sleep quality and the Epworth Sleepiness Scale (ESS) assessing the daytime functioning did not differ significantly between the diabetic smokers and the diabetic non-smokers [$p > 0.05$].

ORIGINAL ARTICLE

REFERENCES:

1. Tononi G, Cirelli C. Sleep function and synaptic homeostasis. Sleep Med Rev 2006; 10 (1): 49 62.
2. Dinges DF. The state of sleep deprivation: from functional biology to functional consequences. Sleep Med Rev 2006; 10 (5): 303-5.
3. Stickgold R, Walker MP. Sleep-dependent memory consolidation and reconsolidation. Sleep Med 2007; 8 (4): 331-43.
4. Peirano PD, Algarin CR. Sleep in brain development. Biol Res 2007; 40(4): 471-8.
5. Laila AlDaball, Ahmed S. BaHammam. Metabolic, Endocrine, and Immune Consequences of Sleep Deprivation. The Open Respiratory Medicine Journal, 2011, 5, 31-43.
6. Sebastian M Schmid, Manfred Hallschmid, Bend Schultes. The metabolic burden of sleep loss. www.thelancet.com/diabetes.endocrinology, online. March 25, 2014.
7. http://www.who.int/mediacentre/factsheets/fs312/en/.Diabetes October 2013.
8. Wetter DW, Young TB. The relation between cigarette smoking and sleep disturbance. Prev Med. 1994 May; 23 (3): 328–34.
9. Phillips BA, Danner FJ. Cigarette smoking and sleep disturbance. Arch Intern Med. 1995 Apr 10; 155 (7): 734–7.
10. Davila EP, Lee DJ, Fleming LE, LeBlanc WG, Arheart K, Dietz N, et al. Sleep disorders and second hand smoke exposure in the U.S. population. Nicotine Tob Res. 2010 Mar; 12 (3): 294–9.
11. Buysse DJ, Reynolds III CF, Monk TH, Berman SR, Kupfer DJ. The Pittsburgh Sleep Quality Index: A new instrument for psychiatric practice and research. Journal of Psychiatric Research 1989; 28 (2), 193-213.
12. Cole JC, Motivala SJ, Buysse DJ, Oxman MN, Levin MJ, Irwin MR. Validation of a 3-factor scoring model for the Pittsburgh Sleep Quality Index in older adults. Sleep 2006; 29 (1), 112-116.
13. Johns, M.W. A new method for measuring daytime sleepiness: The Epworth sleepiness scale. Sleep 1991; 14, 540-545.
14. Fagerstrom K. Measuring degree of physical dependency to tobacco smoking with reference to individualization of treatment. Addictive Behaviors 1978; 3, pp: 235-241.
15. http://pic.dhe.ibm.com/infocenter/spssstat/v20r0m0/index.jsp?topic=%2Fcom.ibm.spss.statistics.
16. S. Ramnathan Iyer. Sleep and Type 2 Diabetes Mellitus- Clinical Implications. JAPI October 2012; vol. 60 pg (42-46).
17. Sridhar GR. Sleep in Type 2 diabetes. J Assoc Physicians India. 2003 Jul; 51:739.
18. Osme et al. Difference between the prevalence of symptoms of depression and anxiety in non-diabetic smokers and in patients with type 2 diabetes with and without nicotine dependence. Diabetology & Metabolic Syndrome 2012 4:39.
19. Breslau N, Kilbey M, Andreski P. Nicotine dependence, major depression, and anxiety in young adults. Arch Gen Psychiatry1991, 8(12):1069–1074.

ORIGINAL ARTICLE

AUTHORS:
1. Sivaraman S.
2. Aarthi R.
3. Ismail M.
4. Thirumala Kolundu Subramanian P.

PARTICULARS OF CONTRIBUTORS:
1. Assistant Professor, Department of Psychiatry, Chennai Medical College Hospital & Research Centre, Irungalur, Trichy, Tamilnadu, India.
2. Final Year MBBS Student, Department of Psychiatry, Chennai Medical College Hospital & Research Centre, Irungalur, Trichy, Tamilnadu, India.
3. Research Coordinator, Department of Psychiatry, Chennai Medical College Hospital & Research Centre, Irungalur, Trichy, Tamilnadu, India.
4. Professor and HOD, Department of Medicine, Chennai Medical College Hospital & Research Centre, Irungalur, Trichy, Tamilnadu, India.

NAME ADDRESS EMAIL ID OF THE CORRESPONDING AUTHOR:
Dr. S. Sivaraman,
#75/5, F Type Railway Colony,
Ponmalai, Trichy-620004,
Tamilnadu, India.
Email: sivaramanaiims@gmail.com