

# Prevalence of Hypertension in school teachers of Bengaluru

Manjula D<sup>1</sup>, Sahu B<sup>2</sup>, Sasikumar NS<sup>3</sup> and Babu GR<sup>4</sup>

1 – Medical Officer (Health), Bruhath Bengaluru Mahanagara Palike, Government of Karnataka;

2 – Assistant Professor; 3 – Research assistant; 4 – Additional Professor; Public Health Foundation of India, Bengaluru.

## ABSTRACT

**BACKGROUND:** The burden of hypertension is rapidly rising in India and if uncontrolled, can lead to greater complications and mortality. Apart from the lifestyle factors, it is important to explore the workplace stressors in the aetiology of hypertension.

**METHODS:** In order to understand the association of hypertension and stress in teachers of urban areas of India, data was collected from 401 school teachers. A self-administered questionnaire was used to collect information on job stress and other risk factors. Data was collected from 123 schools using a validated questionnaire. Blood Pressure of respondents was measured using a modified approach of Peters Schnall and Karen Belkic and classified as per the recommendations of the Joint National Commission (JNC-VII).

**RESULTS:** Among the 401 school teachers, 28% had normal blood pressure, 36% were pre hypertensive, 24% were -1 stage hypertensive and 12% in stage-II hypertension. Among the other results, one fifth of the teachers whose parents/siblings had hypertension had normal BP and more than one third of teachers whose parents did not have hypertension had normal BP (35%). The unadjusted estimates indicate that emotional and work profile stressors were associated with hypertension. However, this effect disappeared after adjusting the confounders.

**CONCLUSION:** There is high prevalence of hypertension among public school teachers of Bengaluru. Creating awareness among BBMP school teachers regarding lifestyle modifications and regular screening of blood pressure is crucial.

## Introduction

The developing world is witnessing higher proportion of aged populations, rapid urbanization and globalization of unhealthy lifestyles (1,2). Non Communicable diseases (NCD) such as CVD (Cerebrovascular Diseases), Cancer, Diabetic mellitus and chronic lung disease are the world's leading cause of mortality (3). Hypertension or raised Blood Pressure is an important risk factor in leading to coronary heart disease, stroke and other vascular complications (3, 4). It is the commonest cardiovascular risk factor that poses a major public health challenge to population in socio-economic and epidemiological transition. (4). Globally, CVD accounts for approximately 17 million deaths every year. One in three adults are affected by high blood pressure and it accounts for 9 million deaths yearly (5). Hypertension is responsible for at least 45% deaths due to heart disease and 51% of deaths to due to stroke (6). There are region and population specific variations noted in prevalence of hypertension in India (1, 7). Hypertension is directly responsible for 57% of all stroke deaths and 24% of all coronary heart disease (8). For rural and urban population of South India, the pooled prevalence of Hypertension was 21.1% and 31.8% respectively (9). In Bengaluru, 21% people are suffering from Diabetes and hypertension (10, 11).

India's pride, Bengaluru is nearly 500 years old and has grown from a small time settlement. Today Bengaluru has grown well beyond into a sprawling metropolis of more than 6 million people and is referred to as the Silicon Valley of India - accounting for more than 35 percent of India's software exports (12, 13). In 2005, from total 23,312 available death records at BBMP, 1690

(7.5%) death are categorized as probable due to stroke. In case study carried out in 2006 in Bengaluru, out of 1174 cases 18% of all strokes patients are below 40 years of age (14). In a study conducted on IT professionals in the city, the prevalence of Hypertension was found to be 31% and pre-hypertension was 45.7%. The prevalence of stage-1 hypertension in the age group of 19-25 years was 18% and 23% in 26-30 years group while the prevalence of stage-2 hypertension in the age group of 19-25 years was 5% and 3% in 26-30 years group (15).

There is an imperative need for population based research to understand the determinants at the organization and community level, influencing the choices and options for people to engage in risk behaviours (15). Workplace settings provide opportunities to explore determinants of the negative health behaviours (15, 16). Among environmental factors, job stress is an important determinant of hypertension and it is well established that job stress can cause Hypertension (16). Job stress is defined as "A set of psychosocial factors experienced by workers due to work conditions, generated as composite experiences at different levels within an organization".

We conducted a cross-sectional study among BBMP teachers and estimated prevalence of hypertension and its association with job stress. Identifying the risk factors may help for workplace intervention to prevent morbidity and mortality conditions and in turn increase the productivity of work force. Identification of risk profiles in teachers can guide worksite interventions to prevent debilitating conditions thereby improving the productivity of the workforce. We hypothesized that there is an association between stress and hypertension among teachers in BBMP schools.

## Methods

The population sample comprised all BBMP school teachers (Nursery, Primary, and High School) from three zones (South, East, West) aged 19 to 70 years. East zone consisted of 54 schools

### Corresponding Author:

**Biswamitra Sahu** Assistant Professor,  
Public Health Foundation of India, IIPH-H, Bangalore campus,  
SIHFW premises, Beside leprosy hospital, 1st cross,  
Magadi road, Bangalore-560023. Phone numbers: +080-23206124  
E-mail address: biswamitra.sahu@iph.org

(high school -14; primary-6; nursery-34 (out of 34, 15 were covered)). West zone consisted of 38 schools (high school-9; primary-3; nursery-26(out of 26, 12 were covered)). South zone consisted of 31 schools (high school-10 primary-3; nursery-18 (out of 18, 13 were covered)).

The eligibility criteria of participant were being a teaching profession and willingness to join the study. We chose convenient sample technique in which units in the sample are collected with no specific probability structure. Data collection was done completely from 123 public schools in BBMP area. More number of teachers are employed in high school and primary schools when compared to nursery schools which are usually maintained by a single teacher. All the 123 schools were completed and no school are left out. In total, we included 408 school teachers in the sample including primary, high school and nursery schools.

We visited each school run by BBMP and conducted the survey in their respective work places. We selected a quiet class room with facilities for Blood Pressure (BP) measurements and for anthropometric measurements. As part of the protocol, we did routine health check-ups and invited the teachers to volunteer for the study. On their consent, a questionnaire was given to them. They completed the questionnaire and handed over to us on the same day. 10 subjects returned them next day. No identifying information of the subjects was collected such as name, email-ID, phone number or even name of the school. We maintained confidentiality and importance of the responses and it was not recorded anywhere.

*Exposure Assessment:* A self-administered questionnaire was administered to collect information on job stress and other risk factors. The issues of work environment have been considered as factors influencing stress All the components of this domain have

been found to be associated with health impacts in earlier studies (16). A detailed description of the domains is provided elsewhere (15).

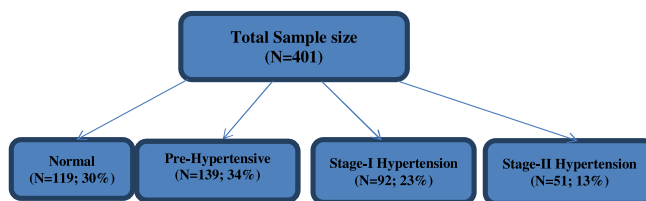
*Outcome Assessment:* Peters Schnall and Karen Belkic have provided a detailed description of the importance of obtaining point estimates of BP approximating ambulatory BP (1). We followed the protocol for obtaining a point estimate of work time BP with slight modifications from what was stipulated.

**Results**

*Demographic characteristics:* In the study sample of 401 school teachers from BBMP, the average Systolic Blood Pressure (SBP) was 132 mmHg and Diastolic Blood Pressure (DBP) was 79 mmHg.

Figure: 1 Flow Chart indicating the the proportion of hypertensive population

The total number of sample is 401, of which 119 had normal blood pressure (30%), 139 were having Pre-Hypertension (34%), 92 were in Stage-I Hypertension (23%) and 51 in Stage-II Hypertension 13%. The socio demographic characteristics of BBMP school teachers with respect to gender, age, employment status and education level in relation with their BP are explained in Table-1.

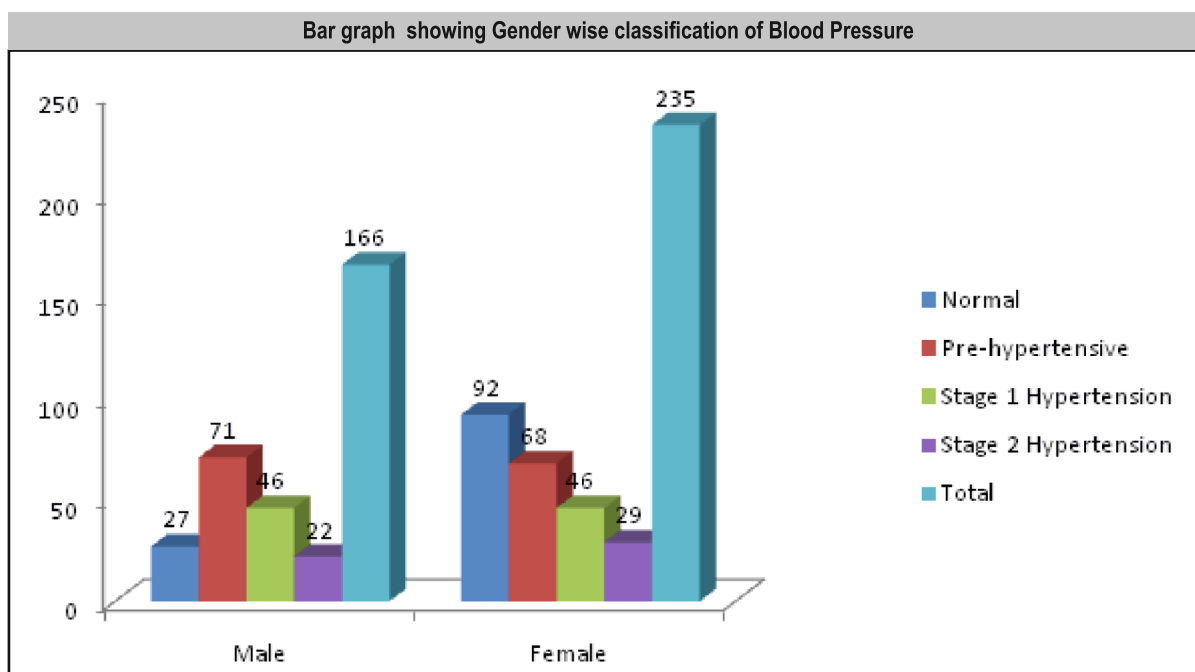


**Table 1: Socio -demographic Characteristics of BBMP teachers in Bengaluru**

Socio- Characteristics		Normal	Pre- hypertensi ve	Stage 1 Hypertension	Stage 2 Hypertension
Gender	Female	39%	29%	20%	12%
	Male	16%	43%	28%	13%
Age	1) Below 30	55%	35%	8%	2%
	2) 31-40	30%	43%	23%	5%
	3) 41-50	14%	36%	30%	19%
	4) 51-60	8%	18%	42%	32%
	5) Above 61>	10%	38%	19%	33%
Employment Sta tus	1. Permanent	10%	37%	33%	20%
	2. Contract	43%	34%	16%	7%
	3. Temporary	43%	30%	17%	11%
Education level	Diploma / PUC	22%	45%	20%	12%
	Degree (BA, B.Sc Etc)	31%	33%	19%	18%
	B Ed	30%	34%	25%	11%
	PG Degree (M.A, M.sc Etc)	35%	31%	31%	4%

It was observed that 33% of permanent employees were having stage-1 hypertension, which is twice more than contractual (16%) and temporary employees (17%). The major stress factors like

parental/sibling diabetic condition, past history of hypertension and Diabetes, BMI, Waist to Hip ratio are presented in relation with BP (Table 2).



**Table 2: Stress Factors associated with Blood Pressure among BBMP teachers in Bengaluru**

		Normal	Pre-hypertensive	Stage 1 Hypertension	Stage 2 Hypertension
Parent/Sibling	Normal	35%	37%	19%	9%
	Hypertensive	20%	30%	30%	20%
Past History of Hypertension	Normal	33%	37%	21%	9%
	Hypertensive	0%	10%	44%	46%
Past History of Diabetes	Present	8%	25%	33%	33%
	Absent	33%	36%	21%	10%
Both Hypertension and Diabetes	Present	0%	5%	45%	50%
	Absent	0%	16%	42%	42%
BMI	1) <18.49	76%	14%	7%	3%
	2) 18.50 - 24.99	32%	40%	19%	9%
	3) 25.00 - 29.99	22%	32%	31%	15%
	4) ≥30.00	13%	32%	28%	28%
Waist to Hip ratio (Male)	< 0.95	17%	43%	28%	11%
	0.96 - 1.0	24%	18%	35%	24%
	> 1.0	5%	59%	18%	18%
Waist to Hip ratio (Female)	< 0.8	63%	17%	13%	7%
	0.81 - 1.0	37%	31%	21%	12%
	> 1.0	25%	31%	19%	25%

Average age of the sample was 40 yrs. Among the offspring of the hypertensive parents, only 20% had normal blood pressure, 50% were suffering from hypertension (stage I & stage II) and 30% were having pre-hypertension. While among the offspring of the non hypertensive parents, 35% had normal blood pressure where as 37% had pre-hypertension and 28% had hypertension (Stage I-19% & Stage II-95%). In our sample 401 sample subjects, 161 are known Hypertensive patients. Among hypertensive population, about 90% of them are in stage-1 (44%) and stage-II Hypertension (46%) despite being under anti-hypertensive medication. This shows that the teachers were not regularly monitoring the blood pressure and were not aware of complications of hypertension.

#### Stress Factors at Work Place Associated with Blood Pressure

The major stress factors at work place were number of travel hours, travel stress, mode of transportation, salary satisfaction, discrimination at work and years of experience have been presented in the Table-3. Among those who experienced stress due to travel, 50% was hypertensive compared to 28% in those who did not have travel stress. Mode of transportation is also one

the important stress factor, with nearly half (48%) of the two wheeler riders were having hypertension compared to 1/3<sup>rd</sup> of teachers who used public transport.

Study subjects who are satisfied with their salary were at risk of developing Hypertension (Pre-Hypertension – 35%, Stage-I Hypertension– 28%, Stage-II – 22%). Contrarily, those people who are not satisfied with salary (temporary/ Contract basis), 38% do not have Hypertension, which can be attributed to them being younger (less than 25 yrs). Discrimination at work place might be one of the causes for developing stress which in turn is leading to Hypertension. In our study there were few subjects, where discrimination was observed only because of Caste. On contrary we could observe that there is no significant difference in developing hypertension due to discrimination. So there is no significant association between discrimination and hyper tension among school teacher. In most experienced people (above 10 years) 33% of them are risk (PHS), followed by 30% and 32% in stage-I and stage-II Hypertension respectively. This may be due to ageing, with similar observations depicted in age classification (Table-3).

**Table 3: Stress Factors at Work Place Associated with Blood Pressure among BBMP teachers**

Stress Factors		Normal	Pre-hypertensive	Stage 1 Hypertension	Stage 2 Hypertension
Number of Travel Hours	Less than 1 hr	32%	36%	18%	14%
	1 to 2 hrs	26%	34%	28%	12%
	2 to 3 hrs	44%	33%	17%	6%
	3 to 4 hrs	10%	30%	60%	0%
Travel Stress	No (0)	35%	37%	16%	12%
	Yes (1)	28%	34%	25%	13%
Mode of Transportation	Car	0%	0%	100%	0%
	Two-wheeler	21%	48%	17%	14%
	Bus	32%	33%	23%	12%
Salary Satisfaction	Others	29%	29%	27%	15%
	Yes (1)	16%	35%	28%	22%
	No (0)	38%	34%	20%	8%
Discrimination at work	No (0)	30%	35%	23%	12%
	Yes (1)	27%	35%	21%	17%
Years of Experience	Below 1 Year	54%	29%	12%	5%
	1 to 3 Years	49%	37%	13%	1%
	3 to 5 Years	33%	49%	13%	5%
	5 to 10 Years	28%	32%	29%	10%
	Above 10 Years	15%	33%	30%	23%

**Table 4. Crude Estimates for age groups with Hypertension in BBMP School Teachers**

Age group (Years)	Normal n (%)	Pre-hypertensive n (%)	Stage-1 n (%)	Stage-2 n (%)	Total n (%)	OR	95% CI	P value
Below 30	67 (16.71)	42 (10.47%)	10 (2.49%)	2 (0.50%)	121 (30.17%)	Reference		
31-40	33 (8.23%)	47 (11.72%)	25 (6.23%)	5 (1.25%)	110 (27.43%)	3.406	1.643-7.061	.001
41- 50	12 (2.99%)	30 (7.48%)	25 (6.23%)	16 (3.99%)	83 (20.70%)	8.867	4.251-18.496	.000
51 - 60	5 (1.25%)	12 (2.99%)	28 (6.98%)	21 (5.24%)	66 (16.46%)	26.181	11.621-58.985	.000
61 and above	2 (0.50%)	8 (1.99%)	4 (1.00%)	7 (1.75%)	21 (5.24%)	9.992	3.520-28.366	.000



## Regression Analysis

Binary logistic regression was conducted using SPSS version 20 for studying the relationship between Hypertension and multiple stress domains. Prior to the same, the outcome variable was re-coded to create a dichotomous variable: Hypertensive and non-Hypertensive. Crude estimates of the following contextual domains were done without accounting for confounders. Emotional environment and work profile stressors showed

relationship with hypertension onset in the respondents. (Table-5)

We adjusted for age, gender, waist by hip circumference, family history of high BP, socio-economic status, marital status, tobacco ever use, moderate physical activity for at least 30 minutes 5 days a week and alcohol use. After adjusting the confounders, none of the contextual domains were found to have association with hypertension.

Table 5. Crude estimates of individual stress domains				
Stress Domain	Level	OR	95% CI	P value
Work Environment stress factors	Low	Reference		
	Middle	1.375	.494 – 3.830	.542
	High	.918	.600 – 1.406	.694
Emotional Environment stress factors	Low	Reference		
	Middle	1.779	1.051 – 3.012	.032
	High	2.841	1.732 – 4.660	.000
Work profile stress factors	Low	Reference		
	High	1.984	1.259 – 3.127	.003
Travel related stress factors	Low	Reference		
	Middle	.683	.339 – 1.376	.286
	High	3.528	.637 – 19.529	.149

Table 6. Adjusted estimates for contextual stress factors				
Stress Domain	Level	Adjusted OR	95% CI	P value
Work Environment stress factors	Low	Reference		
	Middle	.577	.176 – 1.897	.365
	High	.614	.191 – 1.969	.412
Emotional Environment stress factors	Low	Reference		
	Middle	1.091	.595 – 2.000	.779
	High	1.070	.588 – 1.946	.825
Work profile stress factors	Low	Reference		
	High	1.367	.822 – 2.275	.228
Travel related stress factors	Low	Reference		
	Middle	.712	.330 – 1.535	.373
	High	5.349	.800 – 35.761	.093

## Discussion

A high (36 %) proportion of BBMP School teachers are hypertensive with a considerable (12 percent) group being in the more severe stage. Male teachers are more (43 percent) predisposed than their female (29 percent) counterparts; suggesting deeper gender normative context playing a role in the Indian context. These individuals will need to change their life style in order to prevent a progressive rise in blood pressure using recommended life style modification. (10). South Asians are predisposed to be hypertensive a decade earlier compared to developed countries (2, 4). In the study of hypertension in IT/ITES Professional suggests that hyper tension occurs a decade earlier compared to the rest of India and two decade earlier compared to developed countries (1, 4). In comparison, this study found that BBMP school teachers had higher proportion of hypertension (36%) compared to IT/ITES professionals (31%). This could be because IT/ITES professionals are younger compared to BBMP school (average age is 39 years) teachers. It is important that the teachers who are suffering from hypertension should be followed up to prevent Cardio Vascular diseases (CVD).

The prevalence of Hypertension ranges from 10% to 43% in different sub-region and age group in Karnataka. Study done in Coastal Karnataka during 2006-07 showed that the prevalence of Hypertension among the people aged 30 years was 43%, out of them 21.3% are known Hypertensive and 20.2% were newly detected during the study (17). Pooled estimates of the prevalence of Hypertension in South India have been estimated at 21.1% and 31.8% for the rural and urban population respectively (9). The current study does not point out significant associations between various domains of job stress and Hypertension. There is inconsistent evidence regarding the association between job strain and hypertension, and methodological shortcomings preclude firm conclusions. However, a meta-analysis of observational studies on hypertension among occupational groups showed positive associations between hypertension and job strain (16).

Screening for hypertension at the age of 30 years should be mandated so that pre-hypertensive cases are identified very early. This will enable efficient implementation of awareness and preventive activities to reduce the risk of Hypertension. In addition, irrespective of the age, teachers who are known hypertensive should continue monitoring their blood pressure and work towards preventing complications. Non-Hypertensive teachers showed less interest to get their BP checked, despite 36% amongst them being pre-hypertensive. This shows that the knowledge regarding hypertension and its complications is not very well understood by teachers, who are purportedly be educating the community.

We had some limitations in this study. In our study sample, out of 559 BBMP teachers 401 BBMP teachers participated. Eighty seven teachers did not participate due to reasons like leave (47) training (33), and disinclination (7) candidates not available in post (71). Taking into consideration these 87 teachers, there is a possibility that either they were normal or Hypertensive and our

estimation of prevalence of Hypertension may have changed or resulted in an under estimation of job stress and Hypertension. As our study was cross sectional in nature, temporality cannot be established. Hence no causal inference could be established.

In summary, hypertension not only contributes to high morbidity but also has been shown to be associated with high mortality. This can be mitigated as hypertension can be prevented from leading to complications. Managing hypertension would be far less costly and far safer to the patients than cardiac surgeries and dialyses that may be needed when hypertension is missed and goes untreated. Many risk factors leading to hypertension are modifiable and therefore provide an opportunity for preventive efforts. Hence, any intervention that can successfully prevent or reduce hypertension should be viewed as promoting cardiovascular health of individuals.

There are several attempts to prevent hypertension by interventions targeting risk factors such as smoking, salt intake and obesity. Prevention can be done by increasing awareness in BBMP school teachers through early screening. The key message to them is to focus on life style changes and regular monitoring of Blood Pressure. Regular self monitoring or screening programs by health centres can be successful in early detection and management of hypertension. We infer that there is a huge scope to adopt primordial and primary prevention strategies to prevent the increasing burden of cardiovascular diseases. The focus should be on improving awareness about hypertension and to adopt better screening methods for preventing diseases and promoting health.

## References

1. Gupta R., Trends in hypertension epidemiology in India. *Journal of human hypertension*, 2004. 18(2):73-78.
2. Amuna P., Zotor, FB. Epidemiological and nutrition transition in developing countries: impact on human health and development. *Proceedings of the Nutrition Society*, 2008. 67(01):82-90.
3. Yusuf S., et al., Global burden of cardiovascular diseases. *Circulation*, 2001. 104(22):p. 2746-2753.
4. Hackam DG., Anand SS., Emerging risk factors for atherosclerotic vascular disease. *JAMA: the journal of the American Medical Association*, 2003. 290(7): 932-940.
5. Ezzati M., et al., Estimates of global and regional potential health gains from reducing multiple major risk factors. *The Lancet*, 2003. 362(9380):271-280.
6. Lloyd-Jones D., et al., Heart disease and stroke statistics, 2010 update A report from the American Heart Association. *Circulation*, 2010. 121(7):46-215.
7. Gupta R., Meta-analysis of prevalence of hypertension in India. *Indian heart journal*, 1997. 49(1): 43.
8. Rodgers A, Lawes C, MacMahon C, Reducing the global burden of blood pressure-related cardiovascular disease. *Journal of hypertension. Supplement: official journal of the International Society of Hypertension*, 2000. 18(1): S3.
9. Anchala R et al., Hypertension in India: a systematic review and meta-analysis of prevalence, awareness, and control of

- hypertension. Journal of hypertension, 2014. 32(6):1170.
10. Registrar General and Census Commissioner of India, 2011. India, Provisional Population Totals, Paper, 2011:1.
  11. Ghosh M. Regional Disparities in Education, Health and Human Development, in Liberalization, Growth and Regional Disparities in India. 2013, Springer:185-217.
  12. Brunn SD, Williams JF, and Zeigler JD, In:Cities of the world: world regional urban development. 2003: Rowman & Littlefield Publishers.
  13. Sudhira H. In:Studies On Urban Sprawl And Spatial Planning Support System For Bangalore, India. 2008, Indian Institute of Science.
  14. Parthasarathy B. India's Silicon Valley or Silicon Valley's India? Socially embedding the computer software industry in Bangalore. International Journal of Urban and Regional Research, 2004. 28(3): 664-685.
  15. Babu GR, Mahapatra T, Detels R. Job stress and hypertension in younger software professionals in India. Indian Journal of Occupational and Environmental Medicine, 2013. 17(3):101.
  16. Babu GR et al. Is hypertension associated with job strain? A meta-analysis of observational studies. Occupational and Environmental Medicine, 2013:
  17. Rao CR et al., A study on the prevalence of type 2 diabetes in coastal Karnataka. International journal of diabetes in developing countries, 2010. 30(2): 80.

## ANNOUNCEMENT

### KACHCON-2016

*28th Annual conference of Karnataka association of community health  
9th and 10th December and Pre-Conference on 8th December 2016.  
Department of Community Medicine, Sri Siddhartha Medical College and Research Center,  
Sri Siddhartha Academy Of Higher Education, Tumkur*

#### Theme for Pre-Conference CME

*Science, Economics and Research Methods in Applied nutrition.*

#### Theme for Conference

*Prevention and control of Non-Communicable Diseases*

#### Sub Themes

*Diabetes and Cardiovascular Diseases  
Preventive Oncology and Geriatric health care  
Mental Health and Stress Management  
Injury and Domestic Violence  
Eye, Dental and Oral Health  
Environmental Impact on Health  
Healthy living and nutrition  
AYUSH in NCDs  
National Programmes and Policies impacting NCD's burden  
Future prospects in prevention and control of NCDs  
Health education and screening in NCDs  
Disability Limitation and Rehabilitation in NCDs*

#### Dates:

*Last date for abstract submission is 13<sup>th</sup> Oct 2016  
Early bird registration discount open upto 30<sup>th</sup> Sep 2016  
Early registration discount open upto 31<sup>st</sup> Oct 2016*

#### Contact:

<http://www.kachcon2016.in>  
Phone No : 0816-2255045 / 2278867  
Email : kachcon2016@gmail.com