



# Increased Awareness about Diabetes and Its Complications in a Whole City: Effectiveness of the “Prevention, Awareness, Counselling and Evaluation” [PACE] Diabetes Project [PACE-6]

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## Abstract

**Aims and Objectives :** To determine the effectiveness of a large scale multipronged diabetes awareness program provided through community involvement in Chennai.

**Material and Methods:** Mass awareness and free screening camps were conducted between 2004-2007 at various locations of Chennai as part of the Prevention, Awareness, Counselling and Evaluation [PACE] Diabetes Project. During a 3-year period, 774 diabetes awareness camps were conducted to reach the public directly. After the PACE project was completed, 3,000 individuals, representative of Chennai, were surveyed in 2007 using a systematic stratified random sampling technique. The results were compared to a similar survey carried out, as part of the Chennai Urban Rural Epidemiology Study [CURES] in 2001 - 2002, which served as a measure of baseline diabetes awareness.

**Results:** Awareness of a condition called “diabetes” increased significantly from 75.5% in 2001-2002 (CURES) to 81% ( $p < 0.001$ ) in 2007 (PACE). 74.1% of the citizens of Chennai are now aware that the prevalence of diabetes is increasing as compared to 60.2% earlier [ $p < 0.001$ ]. Significantly more people felt that diabetes could be prevented ( $p < 0.001$ ), and that a combination of diet and exercise were needed to do so ( $p < 0.001$ ). Respondents reporting obesity, family history of diabetes, hypertension and mental stress as risk factors increased significantly after PACE ( $p < 0.001$ ). More people were able to correctly identify the eyes (PACE 38.1% compared to CURES -16.1%,  $p < 0.001$ ), kidney (PACE 42.3% compared to CURES 16.1%,  $p < 0.001$ ), heart (PACE 4.6% compared to CURES 5.8%,  $p < 0.001$ ) and feet (PACE 35.0% vs CURES 21.9%,  $p < 0.001$ ) as the main organs affected by diabetes.

**Conclusion:** Through direct public education and mass media campaigns, awareness about diabetes and its complications can be improved even in a whole city. If similar efforts are implemented state-wise and nationally, prevention and control of non-communicable diseases, specifically diabetes and cardiovascular disease, is an achievable goal in India. ©

## INTRODUCTION

**N**on-communicable diseases (NCDs) - such as diabetes, obesity, cardiovascular disease, mental illness and cancer – have already overtaken communicable diseases as the commonest cause of death in India, accounting for 53% of total deaths in 2005.<sup>1</sup> Indeed, India leads the world in the number of people with diabetes (40.9 million) and this number is expected to rise to 69.9 million by 2025.<sup>2</sup> Public

health intervention efforts therefore need to urgently move “upstream” towards primary and primordial prevention.<sup>3</sup>

Public knowledge about diabetes is not commensurate with the magnitude of the problem in India. The Chennai Urban Rural Epidemiology Study (CURES) revealed that 25% of people in Chennai had not heard of a condition called “diabetes”;<sup>4</sup> despite a growing diabetic population, extensive diabetes research and being endowed with numerous diabetologists and diabetes centres. The situation in other parts of India, where such facilities are not available, is likely to be much worse.

It is important to know about the awareness levels about a condition in a population, as knowledge is a critical component in behaviour change.<sup>5</sup> Once awareness

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is created, people are more likely to participate in prevention and control activities.<sup>6</sup> With this in view, the Prevention, Awareness, Counselling and Evaluation (PACE) Diabetes Project was undertaken on a massive scale with the main aim of increasing knowledge about diabetes and its complications in Chennai. This paper deals with the evaluation of the overall awareness outcomes in Chennai after the PACE Diabetes project and compares it with situation in 2001-2002 in Chennai during the CURES study.

## MATERIAL AND METHODS

The Chennai Urban Rural Epidemiology Study (CURES) was a large cross-sectional study done between 2001 and 2002 on a representative sample of 26,001 individuals in Chennai, a metro in south India with a population of approximately 4.7 million people. The CURES study design is described in detail elsewhere<sup>7</sup> and the sampling frame is available at [www.drmoahanddiabetes.com/mdrf/CURES.pdf](http://www.drmoahanddiabetes.com/mdrf/CURES.pdf). Several papers from CURES on the prevalence of diabetes and its complications as well as the awareness levels around 2001-2002 have been published.<sup>4, 8-11</sup>

Results from CURES demonstrated that awareness and control measures are grossly inadequate in Chennai.<sup>4</sup> This prompted us to initiate a large community based diabetes awareness and prevention project called PACE with the support of the Chennai Willingdon Corporate Foundation, a non-governmental organization based at Chennai. The PACE project, launched in 2004, spanned over three years (2004-2007), and its design, reach and implementation are described elsewhere<sup>12,13</sup> and the detailed methodology of PACE project is outlined in another article in the previous issue of JAPI<sup>14</sup> and hence only a brief overview of the methodology is presented in this paper.

The main aim of PACE was to disseminate facts about the increase and effects of diabetes through community education, general practitioner education and media outreach. We focused on five areas: 1) increasing awareness of a condition called diabetes, 2) awareness that diabetes prevalence is increasing, 3) awareness of the risk factors of diabetes, 4) awareness of the potential complications of diabetes, particularly related to the eyes, kidneys, heart and feet and 5) awareness that diabetes is preventable and ways to prevent it. PACE had five major components: 1) public education, 2) media campaigns, 3) general practitioner training, 4) opportunistic blood sugar screening and 5) community based "real life" prevention program.

In PACE, education took place in multiple forms and venues over the three-year period of the PACE project during which we conducted 774 education sessions in various locations covering the whole of Chennai city. Awareness programs were conducted at residential sites, worksites, places of worship, public places and educational institutions through lectures, skits and street plays. Messages were conveyed through popular local television and radio channels and print media. The General

Practitioners (GPs) program included training in diabetes prevention, treatment and the benefit of early detection of complications of diabetes to 232 general practitioners. We also set up 176 "PACE Diabetes Education Counters" across the whole of Chennai, which were regularly restocked with educational materials. Overall, we estimate that the PACE program reached out to nearly 2 million people in Chennai.<sup>14</sup>

The aim of the present paper was to evaluate the success of the awareness part of the PACE project, specifically improvement in the awareness levels about diabetes and its complications in Chennai city as a whole. Baseline awareness levels came from CURES (2001 – 2002) where a representative sample of 26,001 subjects aged  $\geq 20$  years in Chennai answered questions regarding awareness of diabetes which were embedded within the larger epidemiologic survey.<sup>4</sup> The PACE evaluation questionnaire, administered in 2007 after the PACE program was conducted in Chennai, posed only the awareness questions to 3000 adults, aged  $\geq 20$  years, representative of Chennai city, selected using a similar systematic random sampling method as the CURES study so that both the CURES and PACE studies were comparable for the purpose of this analysis.

The PACE evaluation study sample included 100 individuals from each of the randomly selected 30 corporation wards in Chennai, thus yielding a total sample size of 3,000. In each selected ward, five lanes were randomly selected and households situated on the right hand side of the lane or road were considered for surveying and every alternate household was selected with a random start. Within the selected household, one individual was randomly selected for the evaluation program.

The questionnaire was administered either in English or the local language, Tamil, according to the respondent's preference. After the purpose of the study was explained and confidentiality assured, the questionnaire took approximately 10 minutes to administer. The details of the questionnaire are given in Table 1.

In order to avoid bias in the results obtained and to assess the knowledge about diabetes and its complications in Chennai as a whole, neither the subjects who participated in CURES nor the PACE program were specifically targeted by the PACE evaluation program. Because this study aimed to be pervasive in Chennai, a control group was neither desirable nor feasible.

## STATISTICS

Statistical analyses were performed using SPSS for Windows version 10.0 software (SPSS Inc., Chicago, Illinois). Comparisons are made between "CURES" and "PACE". Chi squared test was used for comparing proportions between groups. P value  $< 0.05$  was considered significant.

## RESULTS

Awareness of a condition called "diabetes":

In CURES, 75.5% (19,642 out of 26,001) of the subjects surveyed in Chennai stated that they knew about a condition called "diabetes."<sup>4</sup> In PACE, this percentage increased to 80.9% ( $p < 0.001$ ) (2,427 out of 3,000 subjects surveyed) (Fig. 1). In CURES, there was a significant difference in awareness of a condition called diabetes between males and females (males: 77.4%, females: 73.3%,  $p < 0.001$ ). In PACE, there was no longer a significant difference in awareness between males and females (males: 82.1%; females: 80.3%,  $p = 0.253$ ). There were no significant differences in awareness across age groups in CURES (<35 years: 75.1%, 35 – 50 years: 75.6%,  $\geq 50$  years: 75.5%) or in PACE (age <35 years: 80.5%, 35 – 50 years: 81.2%,  $\geq 50$  years: 81.1%). The overall increase in awareness in PACE was significant, as were the increases in awareness for males and females ( $p < 0.001$ ).

#### Increasing prevalence of diabetes:

With respect to the increasing prevalence of diabetes, in PACE, 74.1% of the subjects surveyed stated that "more and more people are getting diabetes nowadays," compared with 60.2% in CURES and this increase was significant

**Table 1 : Questions used for obtaining data regarding knowledge of diabetes**

1. Do you know what diabetes is?  
Yes  No
2. Do you think, in general, more and more people are getting affected with diabetes nowadays?  
Yes  No
3. What are the factors you think that contribute to diabetes?  
a. Obesity  b. Decreased physical activity   
c. Family history of diabetes  d. Mental stress   
e. High blood pressure  f. Others, specify \_\_\_\_\_
4. Do you know that diabetes can cause complications in other organs?  
Yes  No   
4.1. If yes, name some organs affected by diabetes  
a. \_\_\_\_\_ b. \_\_\_\_\_ c. \_\_\_\_\_ d. \_\_\_\_\_
5. Can diabetes be prevented?  
Yes  No   
5.1. If yes, how can it be prevented?   
a. Diet  b. Exercise  c. Both diet and exercise   
d. Others, specify \_\_\_\_\_

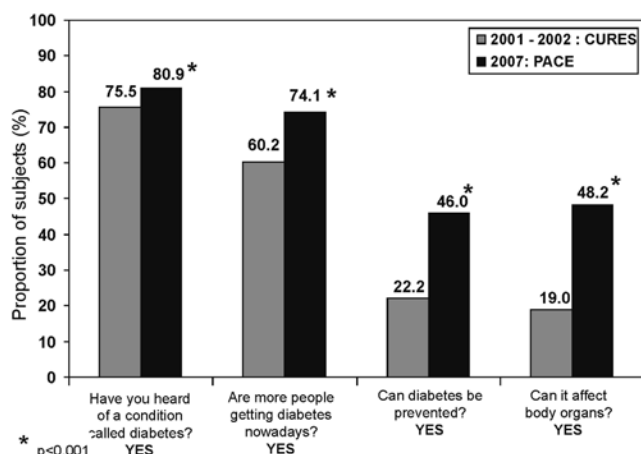


Fig. 1 : Awareness of diabetes among the Chennai population

( $p < 0.001$ ) (Fig. 1). This knowledge increased significantly for both males and females (CURES vs PACE: males-62.6% vs 74.9,  $p < 0.001$ ; females-57.9% vs 73.7%,  $p < 0.001$ ) and across all age groups.

#### Knowledge about contributing risk factors to diabetes:

Respondents were asked to list risk factors for diabetes and the responses were coded by the interviewer. Fig. 2 shows that significant increases were seen in respondents reporting family history of diabetes (CURES vs PACE: 31.6% vs 38.9%,  $p < 0.001$ ), obesity as a risk factor (CURES vs PACE: 4.6% vs 10.7%,  $p < 0.001$ ), mental stress (CURES vs PACE: 4.0% vs 10.2%,  $p < 0.001$ ) and hypertension (CURES vs PACE: 6.8% vs 8.5%,  $p < 0.001$ ) as risk factors for diabetes PACE compared to CURES.

#### Awareness of diabetes complications:

Of subjects surveyed, 19% (4,951/26,001) in CURES knew that diabetes could affect body organs, which significantly increased to 48.2% (1,447/3,000) in PACE ( $p < 0.001$ ) (Fig. 1). Those who answered in the affirmative received an open-ended follow-up question that required them to list the body organs they felt were affected by diabetes. Among those who knew that diabetes could affect body organs, in CURES, 16.1% [795/4,951] of respondents reported that diabetes could affect the eyes, which increased to 38.1% (551/1,447) in PACE ( $p < 0.001$ ). Respondents reporting that the kidneys could be affected by diabetes increased significantly from 16.1% (796/4,951) to 42.3% (612/1,447) ( $p < 0.001$ ), heart from 5.8% (289/4,951) to 14.6% (211/1,447) ( $p < 0.001$ ) and feet from 21.9% (1,085/4,951) to 35.0% (506/1,447) ( $p < 0.001$ ) (Fig. 3).

#### Is diabetes preventable?

In PACE, knowledge that diabetes could be prevented increased significantly overall [CURES vs PACE: 22.2% (5,764/26,001) vs 46.0% (1,379/3,000),  $p < 0.001$ ], as well as for male and female subjects and across age groups ( $p < 0.001$ ). Subjects who stated that diabetes could be prevented received an open-ended follow-up question about the ways to prevent diabetes. For this analysis, the numbers were restricted to those who said diabetes could be prevented [CURES:  $n = 5,764/26,001$  and PACE:  $n = 1,379/3,000$ ]. The interviewer coded these responses

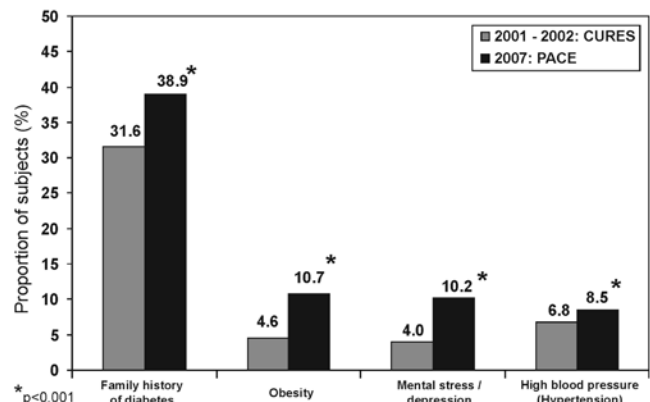


Fig. 2 : Main risk factors for diabetes as reported by study subjects

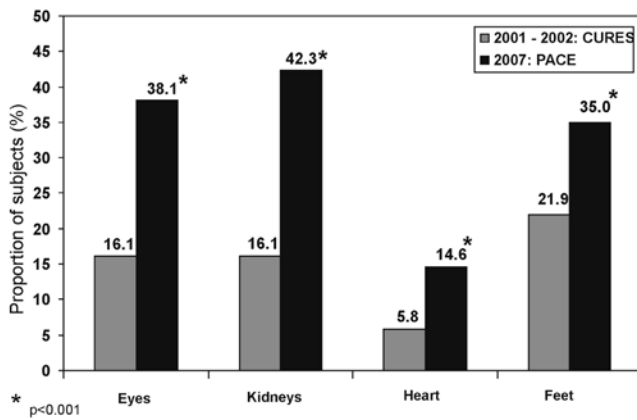


Fig. 3 : Knowledge of diabetes affecting various organs

as “diet,” “exercise” or “diet and exercise”. In PACE, overall percentage of people reporting “diet and exercise” as the way to prevent diabetes more than doubled (CURES vs PACE: 12.1% vs 35.2%,  $p<0.001$ ) (Fig. 4). These trends were also significant both in males and females and across all age groups.

## DISCUSSION

PACE, to our knowledge, is one of the largest diabetes awareness and screening programmes ever conducted at a community level in India. The findings of the present study showed that the awareness about diabetes has increased in Chennai after the implementation of the PACE Diabetes Project.

The 6% increase in awareness of diabetes may appear small but when applied to the projected adult population of Chennai in 2007, which is approximately 3 million, however, this translates to about 180,000 more people who are now aware of diabetes in Chennai compared to 2001. Raising the level of awareness in a city with a population of 4-5 million people may look insignificant when compared to the whole population of India which is 1.1 billion. However, to put it in proper perspective, the population of Chennai is approximately the size of countries like Singapore, Denmark or Sweden and almost 3-4 times the size of countries like Mauritius and hence the PACE Diabetes Project may be considered as a major success from the public health angle.

It is encouraging that, in the PACE project, significantly higher number of people in Chennai as a whole are aware of diabetes, its risk factors and its complications and also, most importantly, more people now know that diabetes is preventable. This would hopefully make people more receptive to future efforts to encourage healthy behaviour changes, as well as to increase both the demand for, and the supply of, preventative health services.<sup>15</sup> These results echo other findings that comprehensive programmes utilizing mass media as well as community activities can have a large impact.<sup>16,17</sup>

In terms of diabetes prevention, many more people identified that both diet and exercise were needed to

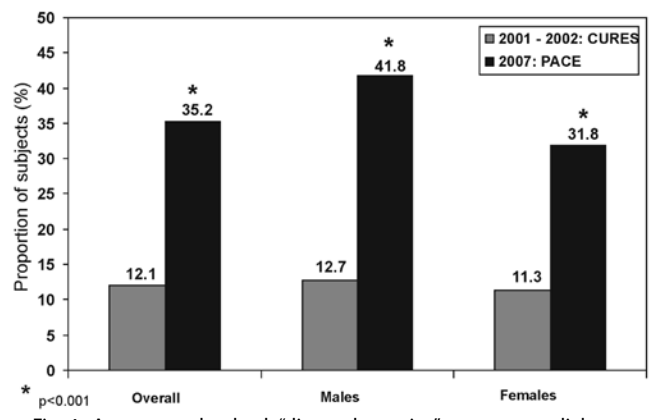


Fig. 4 : Awareness that both “diet and exercise” can prevent diabetes

prevent diabetes, which is an encouraging sign. Thus the PACE Project has helped to establish the importance of diet and exercise as the main lifestyle measures to prevent diabetes among the citizens of Chennai.

The results show that the increase in awareness about diabetes was evenly distributed in both sexes and across all age groups. This shows that the PACE awareness efforts, through a combination of different channels and venues was able to reach both men and women equally as well as people of different age groups. It was particularly gratifying that the difference in awareness levels between males and females noted in the CURES decreased significantly after PACE, suggesting that more females have been successfully educated about diabetes.

Community-based programs for cardiovascular and other non-communicable diseases started in the USA and Europe in the 1970s, but have only recently begun in developing countries, where most efforts till date have focused on communicable diseases.<sup>18</sup> Limited data are available on the efficacy of large-scale awareness interventions for NCDs in developing countries, in part because they have only been attempted in the last decade. It is now clear that prevention of non-communicable diseases through increased awareness needs to be the thrust of the effort in resource-poor contexts, where treatment can be prohibitively costly.<sup>19</sup> Where such information is available, a combination of interpersonal communication, practitioner training and mass media efforts have proved efficacious.<sup>20-22</sup> Such data are extremely important to plan public health policies aimed at preventing and controlling NCDs at a national and community level, particularly in developing countries, like India. Other programmes that have measured outcomes like these, such as Singapore’s National Healthy Lifestyle Programme, the international Quit and Win campaign, and countries affiliated with the World Health Organization’s InterHealth Programme have shown promising changes in behaviours and risk factors.<sup>23-27</sup>

It must be admitted that it is difficult to prove to what extent the results observed were a direct result of PACE Diabetes Project alone. Local newspapers often write articles on health; other governmental and non-governmental organizations such as the Rotary and Lions

Clubs and several other diabetologists and diabetes centres have also been engaged in awareness-raising and screening activities on diabetes in Chennai during the time period in question. Thus the overall improvement is probably due to the combined efforts of multiple agencies. However, as the PACE Project was the largest such effort and involved the community, it seems logical that it would likely have made the largest impact. Also, irrespective of who gets the credit, the fact that awareness levels have increased in a whole city the size of Chennai is very gratifying.

Given the insufficient public knowledge about diabetes revealed in CURES, PACE focused on heightening awareness. Knowledge indicators can serve as useful measures of the extent to which key messages reach their intended targets. Showing that it is possible to communicate with the general public, was thus a key aim of PACE. However, research repeatedly shows that knowledge is only one component of behaviour change. As behaviour is deeply implicated in diabetes prevention and management, future efforts should focus on strategic behaviour change through communication and empowering the communities involved.<sup>28</sup> Indeed, one component of the PACE project currently under progress seeks to assess the behaviour change in a community.

Future research should evaluate different components of such programs separately to see what types and channels of education are most efficacious and cost-effective. These measures would help to better allocate resources in future awareness, behaviour change and social mobilization efforts. A final direction will be to measure the long-term impact of PACE in terms of a) percent of population knowing their own risk for diabetes, b) percent of diabetic patients under good control, c) number of cases likely prevented through behavioural and/or environmental changes, d) social norms around diabetes prevention and management, e) cost effectiveness of the program and f) formulation of policies that facilitate healthy lifestyle.

The scale and scope of the PACE Diabetes Project are unprecedented. This was possible in part because of our location in a major metropolitan area with a high literacy rate and the fact that our centre has an additional research arm with staff dedicated solely to research and outreach efforts. Nevertheless, the results presented here demonstrate that mass awareness campaigns using mass media and interpersonal communication can be carried out in India. Our evaluation results suggest that such programs are also effective in heightening awareness among many different segments of the population. Further progress will require innovative tactics to reach audiences that have been hard to reach till date. We hope that PACE serves as a catalyst for the conduct of additional, carefully planned, implemented and evaluated programmes related to diabetes and other non-communicable diseases in developing countries and the implementation of policies necessary to support such efforts. The results of this project also augurs well for the National Programmes for Prevention and Control

of Diabetes, Cardiovascular disease and Stroke recently launched by the Ministry of Health by the Government of India<sup>29</sup> for which the PACE project can serve as a useful model.

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