

## Does Increased Knowledge of Risk and Complication of Smoking on Diabetes Affect Quit Rate? Findings from a Randomized Controlled Trial in Kerala, India

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### ABSTRACT

**BACKGROUND:** Data on quit rates among diabetes patients are limited.

**PURPOSE:** To find whether positive change in knowledge on smoking-related complications is associated with increased quit rates among diabetes patients.

**METHODS:** We randomized 224 male diabetes patients into intervention groups 1 and 2. Both groups received a standard diabetic-specific smoking cessation message from a doctor. Intervention group 2 additionally received counseling. We compared the positive change in knowledge and the quit rates between the two groups at 6 months.

**RESULTS:** Positive change in knowledge in group 2 was two times higher than that in group 1. The odds of quitting among patients who reported a positive change in knowledge was 2.65 times higher compared to those who reported no positive change in knowledge.

**CONCLUSIONS:** Increasing the knowledge of persons with diabetes about the risks of developing severe complications if they continue smoking leads to significantly higher quit rates.

**KEYWORDS:** smoking, diabetes, Kerala, India

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### Introduction

India has both the second largest number of people with diabetes in the world<sup>1</sup> (63 million) and the second largest number of tobacco users<sup>2</sup> (275 million), eclipsed only by China. For those afflicted with diabetes, smoking is a significant and independent risk factor for heart disease, stroke, and peripheral vascular disease.<sup>3</sup> There is also a strong relationship between smoking and diabetes complications as well as diabetes-related mortality.<sup>4,5</sup> People with diabetes are also particularly susceptible to the adverse effects of smoking.<sup>6</sup> On the basis of mounting evidence on the harm of smoking for those with

diabetes, diabetes experts and organizations have strongly recommended that people with diabetes quit smoking.<sup>1,7</sup> Perception of smoking was associated with motivation<sup>8</sup> and increased smoking cessation rates.<sup>9,10</sup> One study among Malaysian smokers (University staff) reported that perceptions of the advantages and disadvantages of smoking had significant effects on quit rates.<sup>11</sup>

In India, the state of Kerala is well known for both its high level of literacy and high level of public awareness about health issues. However, while major strides have been made with respect to such public health benchmarks as infant and



maternal mortality, Kerala has some of the highest rates of non-communicable diseases in India. Notably, Kerala has one of the highest rates of adult type 2 diabetes in rural South Asia (21%).<sup>12</sup> Kerala also has a smoking rate above India's national average.<sup>2</sup> Of relevance to this paper, research conducted by the Project Quit Tobacco International (QTI) in one peri-urban region of southern Kerala found that more than half of the male diabetes patients were smokers prior to the diagnosis of diabetes, with more than a third continuing to smoke after diagnosis.<sup>13</sup> Only 52% of patients interviewed associated smoking with diabetes-related complications and associated risk with high levels of smoking. Further, only half (52%) of these patients had been advised to quit smoking by a doctor who specifically linked smoking to diabetes complications.

These findings led project QTI to conduct research on the impact of doctors' messages about smoking-related diabetes complications and the added value of combining these messages with cessation counseling.<sup>14</sup> The findings of this study were robust, with 52.2% of patients quitting or dramatically cutting down smoking in both arms of a cessation trial and with significantly more subjects quitting in the counseling arm of the study. This paper provides further analysis of why patients changed their smoking behavior. Our focus is on the extent to which interventions resulted in sustained levels of knowledge about tobacco-related diabetes complications and the extent to which knowledge was correlated with quit rates.

## Methods

The present study is based on a pilot randomized controlled trial among diabetes patients in Kerala, India (CTRI/2012/01/002327, [www.ctri.nic.in/Clinicaltrials/pmaindet2.php?trialid=3806](http://www.ctri.nic.in/Clinicaltrials/pmaindet2.php?trialid=3806)). The Sree Chitra Tirunal Institute for Medical Sciences and Technology, Trivandrum, provided ethical approval for this study.

The methodology of this study has already been published.<sup>14</sup> In brief, among the 2490 male diabetic patients aged 18 years and above who attended two diabetic clinics in Kerala, India, we interviewed 224 diabetic smokers who were literates and native to the clinic catchment area, with a high probability that they would be treated at the clinic for the next 6 months and willing to participate in the study. We randomized the patients into two groups, intervention group 1 and intervention group 2 based on a computer-generated random sequence. Both groups received a standard diabetes-specific tobacco cessation message from a doctor and education materials on smoking and diabetes that focused on disease complications and used easy-to-understand images to illustrate how tobacco affects the vascular system. Intervention group 2 received an additional 30-minute diabetic-specific smoking counseling session by a trained and certified non-doctor health professional who employed the "5 As" (Ask, Advise, Assess, Assist, Arrange), an assessment of stages of readiness to quit, "5 R's" (Relevance, Risks, Rewards, Roadblocks, Repetition), and basic motivational interviewing skills (<http://quittobaccointernational.org/>). Both groups of patients were followed

up at 6 months, and the quit rates (self-reported smoking abstinence during the past 7 days) were assessed. We could follow-up 196 (87.5%) patients (98 in intervention group 1 and 98 in intervention group 2).

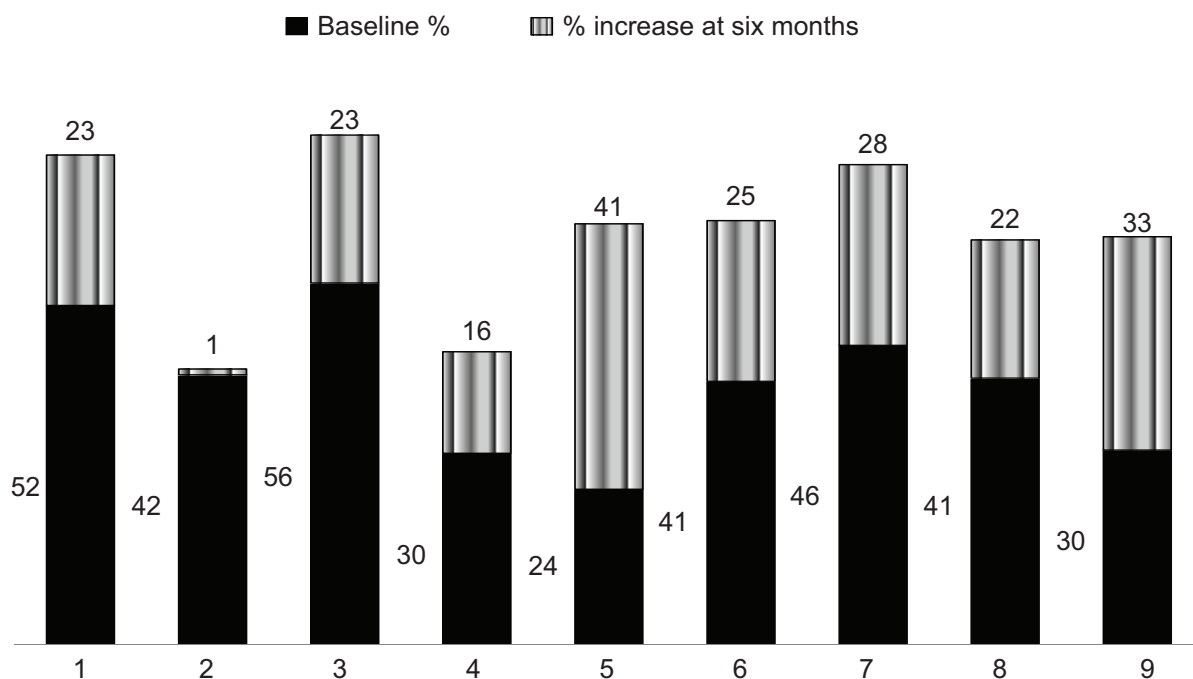
We also collected information on the knowledge related to smoking and diabetes risk and complication. A total of nine questions were asked at baseline and at 6 months follow-up: (1) can smoking cause severe complication for diabetic patients, (2) can smoking increase the risk of getting diabetes, (3) if a diabetic patient smokes, is his risk of suffering a heart attack higher compared to a non-smoker with diabetes, (4) does smoking affect a diabetes patient's sex life, (5) is there an association between smoking and diabetic blood sugar, (6) does smoking reduce the effectiveness of diabetic drugs, (7) does smoking influence a diabetes patient's blood circulation, (8) does smoking decrease a diabetes patient's visual capacity, and (9) does smoking delay wound healing among diabetes patients. Responses to each question were coded "0" for "no" or "don't know" and "1" for "yes." The knowledge score ranged from 0 to 9. The difference in the total knowledge score of each patient at baseline and at 6 months was estimated. Patients with values of 1 and above were categorized into the "positive change" group, and others (zero and less) were categorized into the "no change" group. We compared the positive change in knowledge between the two intervention groups. Statistical comparison of the knowledge level was made between intervention group 1 and intervention group 2 using Fisher's exact test. Quit rate was estimated at 6 months in the total sample and in the two intervention groups separately by positive change in knowledge by computing odds ratio (OR) using binary logistic regression. All the analyses were done using SPSS version 17.0, and statistical significance was set at  $P < 0.05$ .

## Results

Baseline characteristics of the study sample were published earlier<sup>13</sup> and were similar in both groups. Baseline knowledge on risk and complication of smoking on diabetes and percentage increase in knowledge at 6 months follow-up are presented in Figure 1. There was no significant difference between the baseline knowledge for intervention group 1 and intervention group 2.

Positive change in knowledge in the intervention group 2 (73.5%) was significantly ( $P = 0.04$ ) higher than that in the intervention group 1 (59.2%). The odds of positive change in knowledge was 1.91 times higher in intervention group 2 compared to intervention group 1 (OR 1.91, 95% confidence interval [CI] 1.04–3.49).

We further analyzed the association of this change in knowledge with smoking cessation outcome for intervention group 1 and intervention group 2 separately at the 6-month follow-up. Quit rate was significantly higher for patients who reported positive change in knowledge (66.7%) compared with those who reported no positive change in knowledge



**Figure 1.** Baseline knowledge on risk and complications of smoking on diabetes and percentage increase in knowledge at 6 months.

**Notes:** 1. Smoking causes severe complications for diabetes. 2. Smoking increases the risk of getting diabetes. 3. Diabetic smokers have a higher risk of getting heart attack. 4. Smoking affects diabetic patients' sex life. 5. Smoking is associated with diabetic blood sugar. 6. Smoking reduces the effectiveness of diabetic drugs. 7. Smoking influences diabetic blood circulation. 8. Smoking decreases diabetic visual capacity. 9. Smoking delays wound healing of diabetic patients.

(38.5%) on risk and complications of smoking on diabetes for intervention group 2. The odds of quitting among patients who reported a positive change in knowledge was 2.67 times higher compared with those who reported no positive change in knowledge (OR 2.67, 95% CI 1.35–5.29) even after adjusting for age, education, occupation, and subjective socio-economic status. This significant quit rate among those who reported the positive change was mostly contributed by the patients in the intervention group 2.

## Discussion

The present study examined patients' knowledge of diabetes complications related to smoking before and after doctors' educational messages and cessation counseling that reinforced doctors' messages and employed the 5 As, 5 Rs, and basic motivational interviewing skills. This is one of the first studies to examine the impact of education on the link between diabetes complications and smoking and quit rates in a non-Western country. We found that increasing diabetes patients' knowledge about the risks of developing severe complications if they continue smoking leads to significantly higher quit rates. The need to increase awareness about the health effects of smoking to encourage intention to quit was reported from India.<sup>15</sup> The education messages used in the QTI intervention (<http://quittobaccointernational.org/>) were developed following formative research that found diabetes patients want to know not just what complications are caused

by smoking but how smoking causes these complications. We employed images of the vascular system as a series of pipes narrowed by fatty material deposited as a result of smoking and used vivid pictures of disease complications. QTI diabetes and smoking booklets that followed a question-and-answer format were given to patients that addressed patient concerns and answered anticipated queries gleaned from interview data collected during formative research. This may well have contributed to knowledge retention.

We would add two caveats and note one limitation of this study. First, it is possible that the impressive quit rate reported in this study is in part related to Kerala's "health culture" and rising public concern about diabetes and heart disease. It will be interesting to see if similar interventions conducted elsewhere in India achieve comparative rates of cessation. Irrespective of the level of smoking, quit rate was high in the intervention group 2. Secondly, it is likely that motivational interviewing conducted in intervention group 2 reinforced knowledge retention by associating knowledge about diabetes complications with possible future scenarios. The quit rate was self-reported and not validated by any biochemical evaluation. The 5 Rs call for a patient to reflect on how disease complications and rising medical costs might affect the life of their family and place all at risk to many hardships. We would note, however, that doctors' messages about complications alone without motivational interviewing still had a significant impact on patients, although not as great as with counseling.



One limitation of the study is that it is based on self-reported smoking status. Researchers did, however, make an effort to check the accuracy of self-reports with family members who generally know the habits of patients.

In closing, let us note that knowledge alone yields a significant effect on quit rates. Knowledge with greater understanding through counseling in which patients are invited to ask questions and receive motivational interviewing provided by QTI has double the effect. In order for knowledge to have an impact, it often needs to be grounded in one's imagination and rendered personal. For those with diabetes, there is nothing more personal than the specter of going blind or losing mobility. The most common responses we heard from diabetes patients when they first learn of complications caused by smoking is: Had my doctor told me these things before, I would have quit long ago. Why was I not told?

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### Author Contributions

Conceived and designed the experiments: GKM, MN, KRT. Analyzed the data: GKM. Wrote the first draft of the manuscript: GKM. Contributed to the writing of the manuscript: KRT, MN. Agree with manuscript results and conclusions: KRT, MN. Jointly developed the structure and arguments for the paper: GKM, MN, KRT. Made critical revisions and approved final version: KRT. All authors reviewed and approved of the final manuscript.

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