Prevalence of statin use among high-risk patients in urban and rural Vellore, Tamil Nadu: A population-based cross-sectional study

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Abstract:
OBJECTIVES: This study assessed statin use among diabetics and those with coronary heart disease (CHD) in Vellore, Tamil Nadu.

METHODS: A cross-sectional survey was conducted in rural and urban Vellore, among 6196 participants (30–64 years), in 2010–2012. Statin use among those with known CHD and diabetes (on diabetic medication) was recorded. A randomly selected sample of rural diabetics was resurveyed in 2016 to reassess statin use.

RESULTS: Among 61 with CHD, 23 (37.7%) were on statins. Statin use among 422 diabetics aged ≥40 years with low-density lipoprotein ≥70 mg/dl was 13.4% in urban and 7.6% among rural. Statin usage among rural diabetics aged ≥40 years increased from 7.7% in 2010–2012 to 16.6% in 2016.

CONCLUSIONS: Statin use for CHD was below 50% although higher than the use among diabetics, indicating the need to address this low rate of usage among these high-risk groups.

Keywords: Coronary heart disease, diabetes, statins

Introduction
Cardiovascular diseases are the leading cause of death globally, with more than three-quarters of these deaths occurring in low- and middle-income countries.[1] A large proportion of those with risk factors such as diabetes and hypertension are unaware of their risks and are often not on adequate treatment.[2,3] Statins are recommended for cardiovascular protection for high-risk groups (e.g., diabetics and those with atherosclerotic cardiovascular disease).[4] The proportion of individuals using statins among these high-risk groups needs to be documented, to assess if this preventive drug is being adequately utilized in developing countries.

This analysis from a population-based cross-sectional study of coronary heart disease (CHD) and its risk factors in Vellore,[3] Tamil Nadu (South India) assessed the proportion of high-risk individuals (prior CHD or diabetes above 40 years) who reported current use of statins. A sample of rural diabetics from this study[3] was followed up 5 years later to assess changing trend of statin use.

Methods
Setting and methods
A WHO STEPS[3] cross-sectional study was conducted in 48 urban wards and nine villages of a rural block in Vellore district between 2010 and 2012 among 6196 adults aged 30–64 years. In the rural area, all...
individuals in the selected age group were invited for the survey, which was conducted through home-based interviews followed by mobile clinics in the village, where medical history and fasting venous blood samples were collected for glucose and lipids.

In the urban area, one street was randomly selected from each ward and all individuals aged 30–64 years from the first 40 households in the street were invited for screening. Further details regarding the methodology for this study are described in detail elsewhere.[3]

In 2016, a sample of 250 diabetics from the list of 348 diabetics identified in 2010–2012 was chosen by simple random sampling and attempts were made to contact these subjects to update statin usage.

**Statistical methods**

In this analysis, diabetes has been defined as those who reported being on medication, and statin use as those who reported current use of a statin. Sociodemographic factors associated with the use of statins were evaluated using multivariate (logistic) regression using SPSS version 24.0 for Windows (SPSS Inc., Chicago, Illinois, USA). Adjusted odds ratios were calculated between statin use (dependent variable) and age, sex, educational status, and place of residence (independent variables), with *P* < 0.05 taken as the limit for statistical significance.

The study was approved by the Institutional Review Board and Ethics Committee of the institution conducting the study.

## Results

The proportion of subjects reporting current use of statins among rural and urban participants with known diabetes or CHD in Vellore is shown in Table 1. Reported statin use among diabetics aged 40 years or more with low-density lipoprotein (LDL) cholesterol ≥70 mg/dl, was only 13.4% (95% confidence interval [CI]: 9.0%–17.8%) in the urban area and 7.6% (95% CI: 3.7%–11.5%) in the rural area, reflecting overall low use of statins among diabetics. The proportion of participants with preexisting CHD using statins for secondary prevention was higher than the use for primary prevention, 40.0% in the urban area and 33.3% in the rural area [Table 1]. Of those using statins, 90% were on Atorvastatin (100% in the rural area and 84% in the urban area). Rosuvastatin and Simvastatin were the other statins used in the urban area.

Those with higher education (above the eighth standard) and residing in urban areas were significantly more likely to be on statins [Table 2]. The proportion of high-risk males on statins was more than that of females. However, this difference was not statistically significant [Table 2]. The Hosmer-Lemeshow goodness-of-fit test showed that the model was a good fit for the data as the *P* = 0.155 (*P* > 0.05).

Of the 250 randomly selected rural diabetics, 241 were followed up during the follow-up study in 2016. Of the

### Table 1: Proportion of high-risk subjects (diabetes or heart disease) reporting current use of statins

| Group | Statin use among urban subjects, n (%) | Statin use among rural subjects, n (%) |
|-------|--------------------------------------|--------------------------------------|
| All diabetics | | |
| Males | 20/131 (15.3) | 10/95 (10.5) |
| Females | 23/177 (13.0) | 5/107 (4.7) |
| Both | 43/308 (14.0) | 15/202 (7.4)* |
| Diabetics aged ≥40 (years) | | |
| Males | 20/125 (16.0) | 10/91 (11.0) |
| Females | 20/161 (12.4) | 5/105 (4.8) |
| Both | 40/286 (13.9) | 15/196 (7.7) |
| Diabetics aged ≥40 years, with LDL ≥70 mg/dl | | |
| Males | 14/99 (14.1) | 9/85 (10.6) |
| Females | 18/139 (12.9) | 5/99 (5.1) |
| Both | 32/238 (13.4) | 14/184 (7.6) |
| Diabetics aged ≥40 years, with LDL ≥100 mg/dl | | |
| Males | 5/69 (7.2) | 7/77 (9.1) |
| Females | 7/103 (6.8) | 4/92 (4.3) |
| Both | 12/172 (7.0) | 11/169 (6.5) |
| Known CHD | | |
| Males | 12/26 (46.2) | 5/12 (41.7) |
| Females | 4/14 (28.6) | 2/9 (22.2) |
| Both | 16/40 (40.0) | 7/21 (33.3) |

*Significant difference between urban and rural, Chi-square *P*<0.05. CHD=Coronary heart disease, LDL=Low-density lipoprotein
241, 14 had died and eight had migrated. The rate of current statin use in 2016 among the 219 diabetics who were interviewed was 17.0% (95% CI: 11.9%–22.1%), while among diabetics aged 40 years or older it was 16.6% (95% CI: 11.5%–21.7%), which shows an increase from 7.4% (95% CI: 3.7%–11.1%) and 7.7% (95% CI: 3.9%–11.5%), respectively in 2010–2012 [Table 1].

Table 2: Association of sociodemographic factors with current statin use among diabetic patients

| Sociodemographic factor | Statin use, n (%) | Adjusted* OR (95% CI), P |
|-------------------------|------------------|-------------------------|
| Education               |                  |                         |
| Above eighth standard   | 34/221 (15.4)    | 1.89 (1.03-3.47), 0.040*|
| Eighth standard and below| 24/289 (8.3)    |                         |
| Residence               |                  |                         |
| Urban                   | 43/308 (14.0)    | 1.98 (1.06-3.71), 0.033*|
| Rural                   | 15/202 (7.4)     |                         |
| Sex                     |                  |                         |
| Male                    | 30/226 (13.3)    | 1.13 (0.62-2.06), 0.680 |
| Female                  | 28/284 (9.9)     |                         |

*OR additionally adjusted for age using logistic regression, *P<0.05. CI=Confidence interval, OR=Odds ratio

Discussion

Diabetics are at a high risk for cardiovascular events, with or without other risk factors and are advised statins, especially if LDL is ≥ 70 mg/dl, according to the latest consensus statement of the Lipid Association of India.[6] The American College of Cardiology/American Heart Association guidelines also identify diabetics above 40 years of age and especially those with LDL ≥70 mg/dl as a group that could potentially benefit from statin use.[7] However, in this study, use of statins among this high-risk group in both rural and urban subjects in Tamil Nadu, a state with high literacy and access to healthcare, was <15% as compared to 59.5%–62.0% in the United States.[7,8] Although this rate more than doubled between the two periods (2010–2012 to 2016) in the rural area, it was still below 20%. The corresponding change in statin use rate among diabetics in urban Vellore was not assessed in this study.

Ignorance among both patients and health providers regarding the importance of initiating and ensuring compliance to statins among those at high risk of cardiovascular events could be a possible reason for low rates of use. Socioeconomic factors could also be possible reasons in South Asia[8,10] as education, and urban residence was associated with statin use in this study as well.

The prevalence of statin use among diabetics aged 40 years or older in this community-based study (14.0% urban and 7.7% rural) was lower than the rate of statin prescriptions at the secondary hospital in this area (29.0% among diabetics aged ≥40 years attending the diabetic clinic, based on record analysis in January 2013, unpublished data), where many of the study patients availed treatment during the same period. The increase in statin use in the rural community between 2010 and 2016 reflects the increasing awareness of prescribing statins for high-risk individuals and increased availability of low cost statins at the secondary hospital serving this area, where 76% of diabetics attending the diabetic clinic in June 2016 were prescribed statins (hospital data analysis, unpublished). A multi-site analysis of prescriptions at various clinics in eight Indian cities also showed that only 55% of diabetics were being prescribed statins,[11] which were, however, higher than the rate found in this community-based study.

The use of statins for secondary prevention in this community-based study (40% in urban participants and 33% among rural participants) was much higher than the rate of 84/1000 patients with CHD, as revealed by a study analyzing sales by stockists.[12] Given that many patients from this area have access to healthcare through well-functioning tertiary and secondary health centers in this district both private and public, these rates of statin usage for secondary prevention are possibly higher than many other parts of the country. However as compared to the US where the rate of statin use among those with cardiovascular disease was 63.5%,[7] this rate of 33%–40% was lower.

The rate of current use of statins reflects both prescription practices as well as compliance to treatment. This is because there is a possibility that the prescription rates of statins for primary prevention in our study area might have been higher than the proportion reporting current use, as it has been shown that almost half of statin users may discontinue use within 1 year even after a myocardial infarction.[13] Ever use or former use of statins was not obtained in this survey.

In Finland with high access to health care and low out of pocket expenses, 88% persisted with statin use after 1 year of initiation and need for copayments was associated with discontinuation.[14] However, in India, adherence to cardiovascular medications has been
found to be low, as shown by a follow-up study of rural
patients attending a tertiary hospital, where adherence
after 1 year ranged from 21% and 32%.[18]

A systematic review of cohort studies showed that
women and those with low incomes are more likely
to discontinue treatment,[16] a finding reflected by the
lower use among women and those with low education
in our study.

Conclusions
This analysis from a population-based study in a region
with good access to health care reveals that statins are
being used by only a third of subjects who need it for
secondary prevention, while use for primary prevention
among high-risk diabetics is even lower. Reasons for
low statin use like low awareness among health-care
providers, poor patient compliance, and high cost
of statins are issues that need to be dealt with, in the
struggle to reduce the increasing number of deaths due
to cardiovascular diseases, in a country with a rapidly
rising prevalence of diabetes.[3] Increasing the availability
of generic statins affordable to all those at high risk for
cardiovascular events, especially through the public
healthcare system[17] would be an important step in
order reduce cardiovascular morbidity and mortality.
Health systems interventions, especially the integration
of cardiovascular disease management into health
systems at different levels are challenges that need to
be addressed.[18]

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Conflicts of interest
There are no conflicts of interest.

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