Original Article

Unmet Need for Screening for Diabetes Mellitus, Hypertension, and Dyslipidemia in a Population That Is at Risk for NCDs; A Study Among Older Adults in Kottayam District, Kerala

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Abstract

Background: More than half of the people in the geriatric age group have a history of at least one chronic illness, the majority of which are associated with the cardiovascular system. Hypertension, dyslipidemia, and diabetes mellitus are recognized risk factors for cardiovascular disease morbidity and mortality. The early detection of noncommunicable diseases (NCDs) has been found to reduce the disease burden and the associated complications. The study aims to assess the unmet need for screening of NCDs among older adults in the Kottayam district.

Methods: A cross-sectional study was conducted among 420 older adults (60 years and above) in all 11 blocks of the Kottayam district using a structured interview schedule. Statistical analysis using proportions with appropriate stratification was undertaken using SPSS Version 26.

Results: The unmet need for dyslipidemia screening (45.5%) was the highest among the screening. Employment status, socioeconomic status, and education were associated with the unmet need for dyslipidemia screening. Education, employment status, current means of sustenance, and socioeconomic status were associated with the unmet need for screening of diabetes mellitus. The unmet need for screening of only dyslipidemia was 22.4%. Among the participants with hypertension and diabetes mellitus, more than three-fourths (77.0%) had an unmet need for dyslipidemia screening.

Conclusions: Unmet need for screening of dyslipidemia was the highest among all the 3 diseases. About one-eight of those aged 60 and above have not been screened appropriately for all the 3 diseases. Any programmatic effort needs to address this to reduce the burden of NCD morbidity among the elderly.

Keywords:

Diabetes mellitus, hypertension, dyslipidemia, screening, noncommunicable diseases, unmet need

Introduction

The burden of noncommunicable diseases (NCDs) has been increasing over the years, and it has accounted for 41 million deaths each year, equivalent to 71% of all deaths globally.[1] More than 80% of these NCDs consisted of only 4 categories: cardiovascular diseases (CVDs), cancers, diabetes mellitus, and chronic respiratory diseases.[2,3] About three-fourths of all NCD deaths are in low- and middle-income countries because of the rise of NCDs and the ageing of the population.[1]

It is estimated that by 2025, the majority of the older adults worldwide will reside in developing countries.[4] The size of the elderly population in India currently stands at 103 million, constituting about 8.6% of the total population (Census 2011). Within the Indian states, Kerala ranks first in the population of elderly in the country, constituting of 13% older adults out of the total population.[5] This state is moving toward the advanced stage of epidemiological

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transition characterized by a high prevalence of NCDs.[2,6] Kerala is known to have the highest prevalence of diabetes mellitus among all the states in India, and the state has a high age-adjusted mortality rate of CVDs.[7,8]

Hypertension, dyslipidemia, and diabetes mellitus are recognized risk factors for CVD. Around 52% of diabetes mellitus-attributable mortality worldwide occurs among the elderly.[9] Globally, the number of hypertensive individuals is expected to rise from 118 million in 2000 to 214 million in 2025.[10] India already has a very high proportion of persons with diabetes mellitus in the world, with 41 million persons living with diabetes mellitus.[11]

Globally, one-third of ischemic heart diseases are due to high cholesterol levels. Approximately, 2.6 million deaths, which are 4.5% of the total deaths, are estimated to be caused by the raised cholesterol levels.[12]

The costs of care and treatment are more for each elderly with NCDs, irrespective of their socioeconomic status. In the United States, the unmet need for screening of diabetes mellitus among elderly was reported as 40%.[13] The information on screening rates of diabetes, dyslipidemia, and hypertension among older adults is scarcely available from low- and middle-income countries. The factors like lack of health-care personnel, scarce transportation facilities, irregular visits to health-care facilities, lesser perception of general health status, lack of awareness, and insufficient knowledge regarding early diagnosis and screening tests prevent older adults from screening for NCDs.[14,15]

Disabilities resulting from NCDs are significant in old age resulting in compromised quality of life measured in the activities of daily living. So, if the elderly in the early 60s are diagnosed or screened and treated appropriately, it can add to the quality of life in the coming years.

There is an existing program by the Government of Kerala for the control of NCDs—Non-Communicable Diseases Control Programme (NCDCP).[16] This study can enable the existing NCD control program in Kerala to identify the unmet needs for NCD care among the elderly and enable them to plan better in the future. Since diabetes, hypertension, and dyslipidemia are the key risk factors for CVD, these 3 risk factors were only assessed as part of this study.

The National Programme for Health Care of the Elderly (NPHCE)[17] has also included special provisions for the elderly in the diagnosis and treatment of NCDs by collaborating with the NCDCP. By assessing the unmet need in screening among the elderly, it can be seen if the special need of the elderly is covered in the 2 programs regarding NCDs.

Among the districts of Kerala, according to census 2011, the second-highest proportion of elderly was found in Kottayam district (15.5%).[5] Thus, this article aims to assess the unmet need for screening for diabetes mellitus, hypertension, and dyslipidemia among older adults in the Kottayam district and assess the factors associated with the unmet need for screening.

Materials and Methods

The study design was a community-based cross-sectional study conducted on older adults of both sexes who were residents of the Kottayam district for the past 6 months. The sample size was calculated using Open Epi version 3.03a. The prevalence of diabetes mellitus, hypertension, and diabetes mellitus in central Kerala was considered to calculate the sample size. The lowest prevalence reported among these 3 conditions was diabetes mellitus—28%.[18] With a 95% confidence interval, a precision of 7%, and a design effect of 2, the sample size was calculated as 367. Considering a 10% nonresponse rate, the sample size was 403, then rounded off to 420.

This study used multistage cluster sampling. The total population in the Kottayam district was 1,979,384.[5] There were 11 blocks in the Kottayam district. From the district, all 11 blocks were selected. The population of each block was taken from census 2011 data. The number of sampling units to be collected from each block was calculated proportionate to the population in each block. The cluster size was 10, and from each block, panchayats were randomly selected from within which a cluster size of 10 was to be achieved. From each panchayat, 1 ward was randomly selected. This resulted in selecting 42 wards and 10 units from each ward. The screening was done using a set of uniform questions to identify the eligible participants in the household. The older adults who were terminally ill and unable to answer the questions were excluded from the study.

Data was collected using an interview schedule. The interview schedule was structured based on the literature review on various factors associated with unmet needs and based on the operational definitions of the selected NCDs. This structured interview schedule was pretested and then translated into the local language. The pretested interview schedule was translated into Malayalam and back-translated to English by the principal investigator.

The interview schedule captured the basic demographic features, current health status, disease, and included questions for screening status. Unmet need was defined as follows:

1. Unmet need for screening of dyslipidaemia[19]
   a. If the participant has never been screened for blood cholesterol level
   b. If the screening for dyslipidemia was before 1 year/the participant does not check the blood cholesterol level even once a year
   c. If the cholesterol level was abnormal and the participant did not visit any health facility for treatment

If any of these 3 conditions were present, unmet need for screening of dyslipidemia was identified.

2. Unmet need for screening of hypertension[20]
   a. If the participant has never been screened for blood pressure level

b. If the screening for hypertension was before 1 year/the participant does not check the blood pressure level even once a year
c. If the blood pressure level was abnormal and the participant did not visit any health facility for treatment

If any of these 3 conditions were present, unmet need for screening of hypertension was identified.

3. Unmet need for screening of diabetes mellitus[21]
   a. If the participant has never been screened for blood sugar level
   b. If the screening for diabetes mellitus was before 1 year/the participant does not check the blood sugar level even once a year
   c. If the blood sugar level was abnormal and the participant did not visit any health facility for treatment

If any of these 3 conditions were present, unmet need for screening of diabetes mellitus was identified.

The associations between unmet needs and sociodemographic and health-related factors were analyzed using the chi-square test for associations. Data were analyzed using SPSS version 26.

The study was carried out after review and approval taken by the Ethics Committee of Sree Chitra Tirunal Institute for Medical Sciences and Technology (Ref no-SCT/IEC/909/MAY-2016). A written informed consent was obtained from each participant before enrolling into the study.

Results

The overall mean (standard deviation) age of the group was 69.9 (8.5) years (Table 1). More than half of the study participants lived with their spouses and children, and 4.8% of the participants lived alone.

About 25% of the participants had dyslipidemia. Among the 74.5% who had no dyslipidemia, the unmet need for dyslipidemia screening was high (60.7%). Among the 54.5% of older adults who had no hypertension, the unmet need for screening was 26.2%. About 66.0% had no diabetes mellitus, and the unmet need for screening among them was 37.5% (Table 2).

Those with met and unmet needs were categorized by sociodemographic and health-related factors (Table 3). Participants with lower levels of education (up to high school only) had a higher level of unmet need for screening for all the diseases, and this difference was statistically significant for both dyslipidemia and diabetes mellitus. The unmet need for diabetes mellitus was strongly associated with current work or retired status. Those not working/homemakers had a high level of unmet need for screening for diabetes

Table 1. Distribution of Participants by Sociodemographic Characteristics, Kottayam District (N = 420).

	Characteristics	N (%)
Age in years (mean + SD)	69.5 + 8.9	
	60-69	239 (56.9)
	70-79	108 (25.7)
	80+	73 (17.4)
Sex of the participant		
	Male	192 (45.7)
	Female	228 (54.3)
Religion		
	Christian	236 (56.2)
	Hindu	163 (38.8)
	Muslim	21 (5.0)
Education		
	No schooling	17 (4.0)
	Primary school (1-7)	163 (38.8)
	High school (8-10)	155 (36.9)
	Higher secondary (11-12)	36 (8.6)
	Degree	45 (10.7)
	PG and above	4 (1.0)
Current marital status		
	Not married	3 (0.7)
	Married	299 (71.2)
	Widowed	118 (28.1)
Socioeconomic status		
	High income	17 (4.0)
	Middle income	293 (69.8)
	Low income	110 (26.2)

Table 2. Distribution of the Participants by Their Chronic Disease Status and Unmet Need for Screening (Outcome Variables); Kottayam District.

Characteristics	N (%)
Dyslipidemia	
Yes	107 (25.5)
No	313 (74.5)
Unmet need for screening of dyslipidemia	190 (60.7)
Hypertension	
Yes	191 (45.5)
No	229 (54.5)
Unmet need for screening of hypertension	60 (26.2)
Diabetes mellitus	
Yes	143 (34)
No	277 (66)
Unmet need for screening of diabetes mellitus	104 (37.5)
Unmet need for screening of diabetes mellitus, hypertension, and dyslipidemia	50 (11.9)
Unmet need for screening of dyslipidemia only	94 (22.4)
Unmet need for screening of hypertension only	3 (0.7)
Unmet need for screening of diabetes mellitus only	13 (3.1)
Unmet need for screening of diabetes mellitus and dyslipidemia	40 (9.5)
Unmet need for screening of dyslipidemia and hypertension	6 (1.4)
Unmet need for screening of hypertension and diabetes mellitus	1 (0.02)

Table 3. Distribution of Participants by Unmet Need for Screening Status by Sociodemographic Factors; Kottayam District.

	Dyslipidemia		Hypertension		Diabetes Mellitus	
	Met Need (N = 123)	Unmet Need (N = 190)	Met Need (N = 169)	Unmet Need (N = 60)	Met Need (N = 173)	Unmet Need (N = 104)
Age group						
60-69	70 (39.1)	109 (60.9)	100 (73.0)	37 (27.0)	96 (60.4)	63 (39.6)
70-79	31 (42.5)	42 (57.5)	47 (82.5)	10 (17.5)	45 (69.2)	20 (30.8)
80 plus	22 (36.1)	39 (63.9)	22 (62.9)	13 (37.1)	32 (60.4)	21 (39.6)
P value	0.749		0.110		0.435	
Sex						
Male	60 (40.5)	88 (59.5)	79 (69.3)	35 (30.7)	79 (61.2)	50 (38.8)
Female	63 (38.2)	102 (61.8)	90 (78.3)	25 (21.7)	94 (63.50)	54 (36.5)
P value	0.67		0.123		0.697	
Education						
Up to high school	90 (30.5)	167 (69.5)	133 (71.5)	53 (28.5)	132 (58.9)	92 (41.1)
High school and more	33 (58.9)	23 (41.1)	36 (83.7)	7 (16.3)	41 (77.4)	12 (22.6)
P value	0.001		0.101		0.013	
Marital status						
Married	91 (40.1)	136 (59.9)	124 (72.5)	47 (27.5)	123 (61.8)	76 (38.2)
Unmarried/Widowed	32 (37.2)	54 (62.8)	45 (77.6)	13 (22.4)	50 (64.1)	28 (35.9)
P value	0.642		0.448		0.723	
Living arrangement						
With spouse	90 (40.0)	135 (60.0)	122 (72.2)	47 (27.8)	122 (62.2)	74 (37.8)
Others	33 (37.5)	55 (62.5)	47 (78.3)	13 (21.7)	51 (62.9)	30 (37.1)
P value	0.684		0.352		0.911	
Past occupation						
Working	77 (41.9)	107 (58.1)	106 (72.6)	40 (27.4)	106 (64.2)	59 (35.8)
Homemaker/Not working	46 (35.7)	83 (64.3)	63 (75.9)	20 (24.1)	67 (59.8)	45 (40.2)
P value	0.27		0.585		0.456	
Current occupation						
Working/Retired	60 (43.2)	79 (56.8)	83 (72.8)	31 (27.2)	89 (71.2)	36 (28.8)
Homemaker/Not working	63 (36.2)	111 (63.8)	86 (74.8)	29 (25.2)	84 (55.3)	68 (44.7)
P value	0.21		0.734		0.001	
Current means of sustenance						
Own income	59 (48.8)	62 (51.2)	74 (75.5)	24 (24.5)	78 (72.9)	29 (27.1)
Others	64 (33.3)	128 (66.7)	95 (72.5)	36 (27.5)	95 (55.9)	75 (44.1)
P value	0.007		0.611		0.004	
Socio economic status						
High income	94 (42.7)	126 (57.3)	128 (77.1)	38 (22.9)	133 (69.3)	59 (30.7)
Low income	29 (31.2)	64 (68.8)	41 (65.1)	22 (34.9)	40 (47.1)	45 (52.9)
P value	0.052		0.065		0.001	
Disability						
Yes	49 (41.5)	69 (58.5)	52 (70.1)	22 (29.9)	105 (60.0)	70 (40.0)
No	74 (37.9)	121 (62.1)	117 (75.5)	38 (24.5)	68 (66.7)	34 (33.3)
P value	0.53		0.401		0.269	
Perception of having received appropriate health care						
Yes	109 (42.3)	149 (57.7)	147 (76.9)	44 (23.1)	149 (66.8)	74 (33.2)
No	14 (25.5)	41 (74.5)	22 (57.9)	16 (42.1)	24 (44.4)	30 (55.6)
P value	0.021		0.015		0.002	
Family history						
Yes	67 (42.7)	90 (57.3)	91 (79.8)	23 (20.2)	98 (70.0)	42 (30.0)
No	56 (35.9)	100 (64.1)	78 (67.8)	37 (32.2)	75 (54.7)	62 (45.3)
P value	0.22		0.039		0.009	
History of any other disease						
Yes	57 (43.8)	73 (56.2)	68 (73.1)	25 (26.9)	78 (63.9)	44 (36.1)
No	66 (36.1)	117 (63.9)	101 (74.3)	35 (25.7)	95 (61.3)	60 (38.7)
P value	0.165		0.846		0.652	

mellitus. Participants who were economically dependent on others had more unmet needs for screening the diseases. This difference was statistically significant for the unmet need to screen dyslipidemia and diabetes mellitus. The association between income status and unmet need status was statistically significant for dyslipidemia and diabetes mellitus.

Those who perceived that they receive appropriate health care had more unmet needs for all the 3 diseases, and this was statistically significant. The unmet need for screening of hypertension and diabetes mellitus was higher among those who did not have a family history for any of the conditions considered. This difference was statistically significant.

The incidence of unmet need for screening for each of the 3 conditions has been examined singly. However, it is possible that screening for 1 condition is coterminous with screening for any of the other 2 conditions. Alternatively, screening for 1 condition may not be linked to screening for other conditions. To examine this, the participants were categorized by the unmet need for screening status so that each person belonged to a uniquely identified need category, whether with an unmet need for 1 condition, for 2 of them, or all of them (Table 2).

About 50% had no unmet need to screen any of the diseases. It means that 50% have screened for all 3 diseases together. Among those with unmet needs, nearly 1 quarter had an unmet need for screening for all conditions. The unmet need for screening of only dyslipidemia was 22.4%. The unmet need for screening of dyslipidemia and diabetes mellitus was 9.5%. The least unmet need for screening NCDs was for diabetes mellitus and hypertension (0.02%), followed by only hypertension (0.7%).

Being diagnosed with a particular condition could enhance the potential for being screened for other conditions. Alternatively, if 1 condition is diagnosed, it could result in a laissez-faire practice regarding screening for other conditions. A form of stratified multivariate analysis is attempted wherein the unmet need for screening of 1 or 2 of the diseases is estimated after a participant is found to be diagnosed as having 1 or 2 of the NCDs (Table 4).

Among the participants with dyslipidemia, the unmet need for screening for hypertension was nonexistent. About 9.4% had an unmet need for screening of diabetes mellitus only. For those with hypertension, 18.3% had an unmet need for screening for dyslipidemia. Compared to the unmet

Table 4. Distribution of Participants with Unmet Need for Screening When Diagnosed to Have Any One/Two of the Diseases, Kottayam Distric.

Dyslipidaemia present (N = 107)						
Hypertension		Diabetes mellitus		Diabetes mellitus and hypertension		
Met need	Unmet need	Met need	Unmet need	Met need	Unmet need	Met need for either
107	0	97 (90.6)	10 (9.4)	97 (90.6)	0	10 (9.4)
Hypertension present (N = 191)						
Dyslipidaemia		Diabetes mellitus		Diabetes mellitus and dyslipidemia		
Met need	Unmet need	Met need	Unmet need	Met need	Unmet need	Met need for either
156 (81.7)	35 (18.3)	183 (95.9)	8 (4.1)	124 (64.9)	24 (12.6)	43 (22.5)
Diabetes mellitus present (N = 143)						
Dyslipidemia		Hypertension		Dyslipidemia and hypertension		
Met need	Unmet need	Met need	Unmet need	Met need	Unmet need	Met need for either
108 (75.5)	35 (24.5)	142 (99.3)	1 (0.7)	105 (73.4)	2 (1.4)	36 (25.2)
Dyslipidemia and hypertension present (N = 84)						
Diabetes mellitus						
Met need	Unmet need					
77 (91.7)	7 (8.3)					
Hypertension and diabetes mellitus present (N = 95)						
Dyslipidemia						
Met need	Unmet need					
21 (22.2)	74 (77.8)					
Dyslipidemia and diabetes mellitus present (N = 64)						
Hypertension						
Met need	Unmet need					
64 (100)	0 (0)					

need for screening for dyslipidemia, the unmet need for screening for diabetes mellitus was just about one-fourth. About 24.4% were likely to have an unmet need for dyslipidemia screening when they were diagnosed with diabetes mellitus. In the case of diagnosis of diabetes mellitus, almost all (99%) are likely to have their needs met for screening of hypertension.

Nearly 90.0% of those with dyslipidemia are likely to meet the screening needs for diabetes mellitus and hypertension. Only about two-thirds (64.9%) of those with hypertension are likely to be screened for diabetes mellitus and dyslipidemia. Among those with diabetes mellitus, nearly three-fourths (73.3%) are likely to meet their screening needs for hypertension and dyslipidemia. Among these older adults with hypertension and diabetes mellitus, more than three-fourths (77%) will have an unmet need for dyslipidemia screening.

Even though the question of temporality exists here, this essentially means that persons with dyslipidemia are screened appropriately for hypertension and diabetes mellitus. A person with diabetes mellitus is less likely to be adequately screened for dyslipidemia but will certainly be screened for hypertension. Even for those diagnosed with hypertension and diabetes mellitus, the proportions of persons screened for dyslipidemia are barely one-fourth. More than three-fourths of those with both these conditions are not appropriately screened.

Discussion

Screening for chronic conditions and treating them significantly reduce the disease burden among the elderly population. However, public health explorations tend to focus on the prevalence of disease and health-care utilization. In this context, examining the proportion of those who are not screened at all, but need to, fill the gap in the prevention strategy. This study has identified that one-eighth of those 60 years and above were not screened appropriately for all 3 diseases.

About 37.5% had an unmet need for screening of diabetes mellitus. This figure is slightly lower when compared to the findings of a study from the United States on the self-reported prevalence of diabetes mellitus screening from 2005 to 2010, which reported that the prevalence of having a blood test for diabetes mellitus in the past 3 years was 60.7% among the 60 plus population. This study from the United States also identified screening predictors as education, income, and family history. The present study has also identified similar factors associated with the unmet need for screening for diabetes mellitus.[22] It suggests that appropriate screening for diabetes mellitus is lower among economically and educationally underprivileged people.

The unmet need for hypertension screening was 26.2%, which was associated with family history and perception of having received appropriate health care. This proportion is lower than that found in a study from Pakistan, which reported that about 40.4% of the participants aged 50 and above had ever checked their blood pressure.[23]

The unmet need was less, probably because the chance of getting the blood pressure checked is very high for a person going to a health-care provider for any reason. A study from the United States also agrees with this statement in which about 56% of all patient encounters included a blood pressure measurement in the people aged 18 and above.[24]

CVDs are the most prevalent causes of death among all the NCDs, and dyslipidemia is a significant risk factor for CVDs.[25,26] Due to the asymptomatic nature of lipid disorders, screening is required for detection. Detection of dyslipidemia in earlier stages of life can aid in the earlier management strategies, which can prevent CVD in the future.[27,28] Regardless of all these facts, the elderly population in this study had a very high unmet need to screen for dyslipidemia. A significant proportion (22.0%) of them is not screened for dyslipidemia alone. A study from the United States reported that the screening rate of dyslipidemia in 2009 was 94.7% in the elderly population (>65 years). In contrast, in the present study, the unmet need for dyslipidemia screening was 60.7%.[29]

The one-time expenditure for screening of dyslipidemia is higher when compared to expenditure for screening of hypertension and diabetes mellitus.[30] This might be a reason for the high levels of unmet need for dyslipidemia screening. Comparing the blood pressure and blood glucose monitoring process, the testing process of cholesterol levels is complex and time-consuming. It requires blood to be collected by a lab technician and checked. These reasons could contribute to the relatively greater extent of the unmet need for screening the same.

In this study, the participants reported the cost of treatment which included the cost of medication, the expenditure involved in screening, and expenditure incurred for travelling costs as a barrier to receiving the required health care. These older adults had to depend on someone else to get them to the health facility. These could be the probable reasons for the unmet need for screening too. Lower education levels, economic dependence, lower socioeconomic status, and perception of having received appropriate health care were the factors associated with the unmet need for screening of dyslipidemia. A study from Malaysia among the adult population also found that secondary level of education was associated with higher awareness of dyslipidemia.[31] Another hospital-based study from Canada showed that the screening rates were higher among people with higher socioeconomic status.[32] This implies that the economically and educationally disadvantaged people had higher unmet needs.

The results indicate that even when elderly persons are diagnosed with hypertension and diabetes mellitus, screening for dyslipidemia was done in only about 22.2% of them. This essentially means that even after having been diagnosed with 2 conditions that are risk factors for CVD, the elderly are not screened appropriately for the third one if the third one is dyslipidemia.

Among those with an unmet need for screening for any of the 3 conditions, nearly half had an unmet need for screening for dyslipidemia alone. About one-eight of those aged 60 and above have not been screened appropriately for all the 3. Among the people who have only diabetes mellitus or are diagnosed with only hypertension, the unmet need for screening of dyslipidemia was found to be relatively higher when compared to the unmet need for screening for the other two.

There is a need to ensure that older adults are screened for all the 3 diseases at least once a year. The study gives a clear idea about the unique needs of the elderly, and receiving the perceived health care was a determining factor for screening in all the diseases studied. The cost of treatment and travel to facility acts as barriers to receiving health care. A comprehensive screening strategy for all the 3 NCDs should be formed considering the particular needs of the elderly. Like diabetes mellitus and hypertension, screening facilities for dyslipidemia should also be available to this population at risk. For reducing morbidity and mortality and the cost of health care, in the long run, the screening for all 3 NCDs needs to be made accessible, available, and affordable to the elderly population.

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Declaration of Conflicting Interests

The author declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Ethical Approval

The study was carried out after review and approval by the Ethics Committee of Sree Chitra Tirunal Institute for Medical Sciences and Technology (Ref no-SCT/IEC/909/MAY-2016).

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