International Journal of Community Medicine and Public Health
Uthkarsha D et al. Int J Community Med Public Health. 2025 Jul;12(7):3247-3253
http://www.ijcmph.com
pISSN 2394-6032 | eISSN 2394-6040

DOI: https://dx.doi.org/10.18203/2394-6040.ijcmph20252124

Original Research Article

Assessment of the knowledge of community health workers about type 1 diabetes mellitus: a cross-sectional study from rural Karnataka

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Received: 30 April 2025
Revised: 17 June 2025
Accepted: 18 June 2025

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ABSTRACT

Background: Type 1 diabetes mellitus (T1DM) is a chronic autoimmune condition primarily affecting children and young adults, requiring lifelong insulin management. Optimum management and early diagnosis are essential to prevent further health complications. In rural India, accredited social health activists (ASHAs), as frontline community health workers, play a key role in health education and early intervention. However, their knowledge regarding T1DM is less explored. Thus, this study aimed to assess the baseline knowledge of ASHA workers and community health workers (CHWs) about T1DM in rural and urban primary health centres of Bengaluru rural district, Karnataka, India.

Methods: A cross-sectional study was conducted in Karnataka, over a time-period of 3 months in 2024, among 156 ASHA workers selected through systematic random sampling from primary health centres (PHCs) attached to the medical institution. A pretested, semi-structured questionnaire was used to assess knowledge on T1DM and its definition, symptoms, risk factors, complications, and management. Knowledge levels were categorized as good, adequate, or poor based on the number of correct responses.

Results: According to the survey, only 14.1% of the participants had heard of type 1 diabetes, and only 11.5% had received training on the condition. 64.7% of participants were unable to distinguish between type 1 and type 2 diabetes, and the majority (64.1%) were not aware of its usual pediatric onset. There were many misconceptions, as 55.1% of individuals believed that consuming excessive sugar was the cause of T1DM. Just 25% of respondents correctly identified each significant symptom. 90.4% of the study participants fell under the poor knowledge category as they answered only 1-5 questions correctly.

Conclusions: The study revealed a significant knowledge gap among CHWs and ASHA workers regarding T1DM. This underscores the urgent requirement to include focused T1DM education in ASHA educational modules. Improving ASHA knowledge can help children with T1DM in underserved rural settings by empowering early diagnosis, raising community awareness, and enabling timely management. This can minimise complications and improve outcomes.

Keywords: ASHA, Awareness, Community health workers, Diabetes management, Knowledge assessment, Type 1 diabetes mellitus

INTRODUCTION

Diabetes is a chronic condition which poses a major global health threat and one of the fastest-growing epidemics. Diabetes was the cause of 6.7 million deaths in 2021 which is one death occurring every five seconds. [1] WHO estimates that more than 50% of people with diabetes are undiagnosed.[2] Type 1 diabetes mellitus (T1DM), which is the most common endocrinological condition found in children, is a chronic autoimmune disorder that is caused due to the widespread damage of the insulin-producing beta cells in the human pancreas.[3,4] T1DM generally affects the group of 0-19 years unlike lifestyle causative type 2 diabetes that is seen in the adult population generally where insulin resistance is high.[5] It is characterized by low or absent endogenous insulin and management depends totally on lifelong exogenous insulin.[6] Globally, 8.75 million people live with type 1 diabetes mellitus (T1DM) as of 2022 with 530,000 new cases of T1DM getting added every year.[7] The number of cases of type 1 diabetes mellitus (T1DM) show an upward trend with a 3-5% increase per year. [8] There is an increasing incidence of T1D cases among young adults and adolescents from 7.78 per 100,000 population in 1990 to 11.07 per 100,000 population in 2019.[9] According to the International Diabetes Federation Atlas Reports 2022, the number of children living with type 1 diabetes in India is 282,832.[10]

Over 1 in 2 people living with diabetes globally are undiagnosed.[11] T1DM usually goes undiagnosed due to the lack of knowledge about the signs and symptoms of the condition.[12]

Undiagnosed diabetes is a big public health concern in India, considering the accumulative burden of diabetes and the long-term complications it can have on the individual. Incomplete and lack of knowledge about T1 diabetes leads to suboptimal control and can often lead to major complications including diabetic retinopathy, damage to the kidneys and the cardiovascular system and diabetic nephropathy.[13]

Post diagnosis, living with this life-long condition and managing its highs and lows every single day is an incredibly challenging task. Families from rural and marginalised communities that have children diagnosed with T1DM have no diabetes education, social support or access to specialty care.[14] To aid these families with daily management and to help with early diagnosis of T1DM cases in rural India, the involvement of community health workers (CHWs) like the ASHA (accredited social health activist) is crucial.

ASHAs are community health workers, often seen as the women in pink, employed by the Ministry of Health and Family Welfare (MoHFW) as a part of India's National Rural Health Mission (NRHM). Typically, there is one ASHA worker for every 1000 people.[15] They are the first point of contact for communities, and they are key members of India's rural infrastructure, playing a pivotal role in health education and early intervention. In a developing country like India, where we see minimal access to quality healthcare and health knowledge in rural areas, the ASHA play a significant role in connecting the marginalised communities to the health system.[16] The authors of the current study found a dearth of research papers addressing and assessing the knowledge of ASHA/CHWs regarding T1DM, although there have been a few specific to type 2 diabetes. It was also observed that the training module on non-communicable diseases (NCDs), did not cover the symptoms, risk factors or management of T1DM in particular. So, to address these gaps, the present study aims to assess the baseline knowledge of ASHA workers regarding T1DM with a focus on understanding of its symptoms and management. By educating the ASHA workers we can effectively empower these underserved communities with diabetes knowledge and thus aid in early diagnosis and prevent further complications including diabetes ketoacidosis (DKA).

The findings of this study have the potential to inform future health education programs and could help strengthen the overall healthcare delivery system in rural India, ultimately improving early detection, management and support for individuals affected by T1DM.

Objective of the study

To assess the knowledge of community health workers of selected primary health centres of Bengaluru rural district about type one diabetes mellitus.

METHODS

Study design and duration

A cross-sectional study was conducted for a period of three months from July to August 2024, among community health workers (CHWs)/accredited social health activists (ASHA) workers after obtaining the institutional ethical clearance and permissions from respective authorities.

Study setting and methods

The study was carried out among ASHA workers in rural primary health centres, Bengaluru affiliated to Sri Siddhartha Institute of Medical Sciences and Research Centre, T. Begur.

Sample size calculation

There are 14 PHCs in Bangalore's rural district. Among them we have chosen our institution's RHTC and UHTC i.e. Thyamagondlu CHC and Makali UHTC, respectively.

Sample size was calculated using a formula Z^2pq/d^2. Piloting was done among 30 ASHA workers, and the

percentage of adequate knowledge was found to be 18%. To determine the required sample size, a 90% confidence level (Z_α=1.645) and a margin error of 8% were considered (d=5). Using the standard formula for sample size calculation, the required sample size was computed to be 156.

Sampling technique

Probability proportional to size (PPS) was used to include ASHA workers in the study. There are 148 and 275 ASHA workers working under Rural and Urban PHCs attached to Sri Siddhartha Institute of Medical Sciences and Research Centre, respectively. Rural PHC- 148 ASHA workers, Urban PHC- 275 ASHA workers. Applying PPS at this step:

Rural PHCs: 148 X 156 =54.5

Urban PHC: 275X 156 =101.4

Therefore, 55 ASHA workers and 101 ASHA workers were considered from rural and urban PHCs, respectively. The samples were selected through systematic random sampling technique. The first sample was chosen by lottery method, later every 3rd subject (sampling interval) was considered from both urban and rural PHCs for the study till we reached the desired sample size.

A total of 156 ASHA workers were part of the study. The exclusion criteria for the study were: i) ASHA workers who were absent during the study period, ii) those who did not wish to participate in the study, iii) the workers who were not present even after three consecutive visits during data collection.

The ASHA workers were briefed about the study during the monthly review meeting at the PHC. After informed verbal consent was obtained, the data was collected using a pretested, semi structured, self-administered questionnaire in the local language Kannada and English.

The workers were made to sit at a distance from each other and were given 20 minutes to answer the questionnaire. The questionnaire had variables to collect information on demographic details and variables to assess their type 1 diabetes knowledge, specifically related to the definition, symptoms, risk factors, complications, and management of type 1 diabetes.

The number of correct and incorrect answers were noted, and the areas of knowledge gap were identified. Each participant answered a total of ten questions. Based on their scores, participants were classified into three knowledge categories: Good knowledge: more than 8 correct answers, adequate knowledge: 5 to 8 correct answers, poor knowledge: less than 5 correct answers.

The data collected was analyzed using the Statistical Package for the Social Science (SPSS version 28) and the descriptive data was expressed in proportions and percentages. A chi-square analysis was used to study the association between knowledge and socio-demographic variables. Data was presented in the form of tables, figures, and charts wherever necessary.

Confidentiality and anonymity of the study participants were maintained.

RESULTS

Demographic details

The study's participants are primarily aged 21-40 years, representing over 80% of the sample, with 49.4% (77 participants) in the 21-30 age group and 32.7% (45 participants) in the 31-40 range (Figure 1).

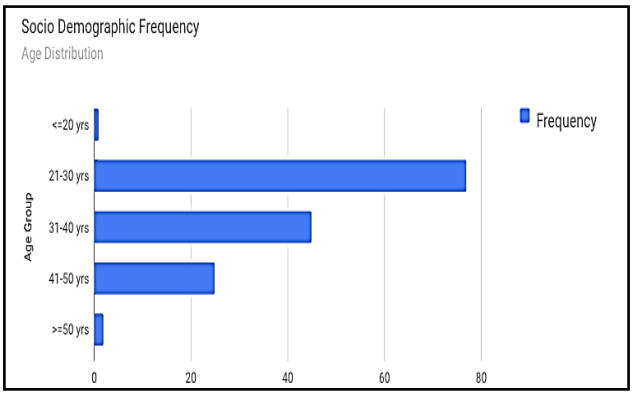

Figure 1: Age distribution of ASHA workers.

Table 1: Education status and years of experience.

Education	Number of participants	Percentage
BSc	1	0.6
BA	1	0.6
PUC (12th grade equivalent)	95	60.9
SSLC (10th grade equivalent)	59	37.8
Total	156	100.0
Years of experience		
1-5	15	9.6
6-10	78	50.0
11-15	61	39.1
16-20	2	1.3
Total	156	100.0

Mean age of experience- 9.7 years (standard deviation =3.07 years; minimum age: 3 years and maximum age: 16 years).

Most participants have a pre-university (PUC) education (60.9%, 95 participants), followed by those with a secondary school leaving certificate (37.8%, 59 participants), while only a few held higher degrees like BSc or BA. In terms of experience, half the sample

(50.0%, 78 participants) has 6-10 years, and 39.1% (61 participants) have 11-15 years, indicating a workforce with significant mid-level experience (Table 1).

Knowledge on type one diabetes among study participants (n=156)

The survey showed limited awareness of type 1 diabetes (T1DM), with only 14.1% having heard of it and 11.5% receiving related training. Most participants (64.1%) were unaware of its typical pediatric onset, and 64.7% could not differentiate between type 1 and type 2 diabetes. Misconceptions were prevalent, with 55.1% attributing T1DM to excessive sugar intake. Only 11.5% correctly identified insulin deficiency as the cause, emphasizing the need for improved education on T1DM (Table 2).

Table 2: Age of onset, training, T1 diabetes versus T2 diabetes, cause.

Knowledge questionnaire	Answers N (%)
Heard about type 1 diabetes mellitus	
Yes	22 (14.1)
No	134 (85.9)
Age of onset	
Pediatric age group	13 (8.3)
Adult age group	38 (24.4)
Geriatric age group	2 (1.3)
All of the above	3 (1.9)
I do not know	100 (64.1)
Any training related to type one diabetes	
Yes	18 (11.5)
No	138 (88.5)
Type 1 and type 2 diabetes are different	
Yes	21 (13.5)
No	34 (21.8)
I do not know	101 (64.7)
Cause of T1DM	
Eating too much sugar	86 (55.1)
Body does not produce insulin	18 (11.5)
Wrath of God	49 (31.4)
All of the above	3 (1.9)
I do not know	0 (0)

Symptoms and management of T1 diabetes and hypoglycemia

Nearly 2.6% recognized excessive thirst and urination as symptoms of T1DM, only 25% identified all key symptoms, and 20.5% were unsure. Regarding management, 40.4% incorrectly believed T1DM could be cured with tablets and exercise, and only 17.3% identified insulin as essential. For hypoglycemia, 42.9% identified symptoms like dizziness and hunger, but 45.5% were unsure. While 30.1% correctly suggested eating carbohydrate-rich snacks as management, many had misconceptions, with 19.9% incorrectly recommending exercise. These findings underscore gaps in knowledge about both conditions (Table 3).

Table 3: Symptoms, management and hypoglycemia knowledge.

Symptoms of type one diabetes mellitus	N (%)
Weight loss	1 (0.6)
Bedwetting in children who never previously did	2 (1.3)
Excess urination and excess thirst	82 (52.6)
All of the above	39 (25.0)
I do not know	32 (20.5)
Management of type one diabetes	
With Ayurveda solutions	12(7.7)
With exercise and diet	1 (0.6)
Through insulin	27 (17.3)
With tablets	20(12.8)
Tablets and exercise	63 (40.4)
I do not know	33 (21.2)
What is hypoglycemia?	
Less sugar in food	2(1.3)
Less sugar content in blood	6 (3.8)
High Blood pressure	2 (1.3)
More sugar in the blood	84 (53.8)
All of the above	8 (5.1)
I do not know	54 (34.6)
Symptoms of hypoglycemia	
Dizziness, Hunger	16 (10.3)
Leg pain	2(1.3)
Bleeding	0 (0.0)
All of the above	67 (42.9)
I do not know	71 (45.5)
How is hypoglycaemia managed?	
Sleep	14 (8.9)
Exercise more	31 (19.9)
Eat carbohydrate-rich snack	47 (30.1)
Take Insulin	35 (22.4)
All of the above	24 (15.4)
I Do not know	5 (3.2)

Referral facilities and complications

As seen in Figure 2.1, only 32.1% recognized T1DM as a lifelong condition, while 44.2% were unsure Figure 2.2 displays the choice of referral facility that the ASHAs would refer patients to with 53.8% of them choosing super-specialty hospital.

Awareness of complications was limited as shown in figure 2.3, with 46.2% identifying kidney damage, and only 19.2% acknowledging all major complications. Regarding management facilities, the majority (53.8%) identified super-specialty hospitals as the preferred referral centre, but 21.8% lacked knowledge of appropriate facilities. These findings underscore the need

for improved education on the long-term management and healthcare options for T1DM.

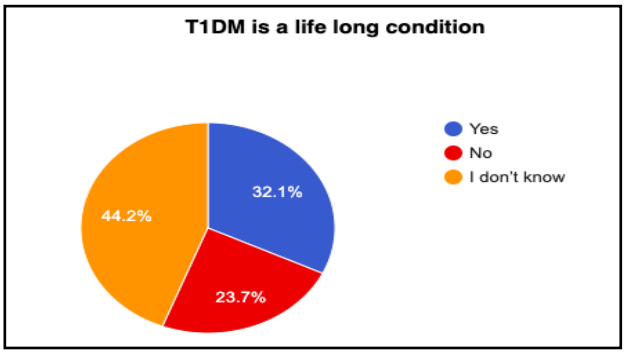

Figure 2.1: Lifelong condition.

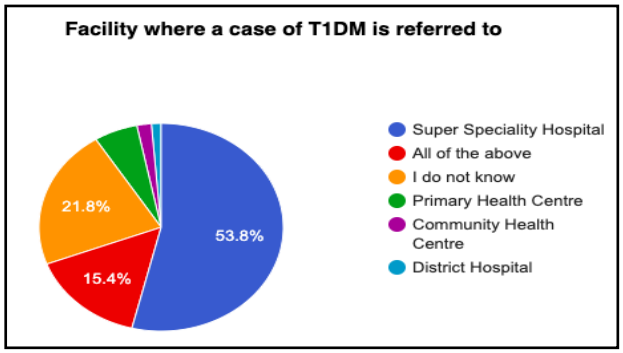

Figure 2.2: Facility of referral.

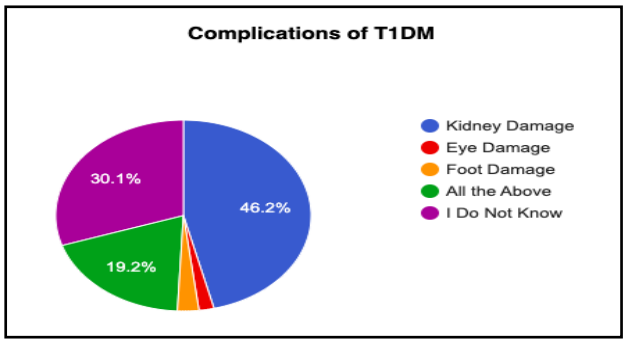

Figure 2.3: Complications of T1DM.

Table 4: Knowledge categorization.

Knowledge score		
Category	**Frequency**	**Percentage**
Poor (1-5)	141	90.4
Adequate (6-8)	11	7.1
Good (>8)	4	2.6
Total	156	100

The results in Table 4 showed that 90.4% of the participants answered only 1 to 5 questions correctly, categorizing them under poor knowledge. Participants who answered up to 8 questions correctly accounted for 7% and were classified as having adequate knowledge. Those who answered more than 8 questions correctly were categorized under good knowledge.

DISCUSSION

In the present study, results show limited awareness of ASHA workers regarding type 1 diabetes (T1DM), with only 14.1% of the study population having heard of it. Most participants (64.7%) could not differentiate between type 1 and type 2 diabetes. Only 17.3% of the ASHA workers correctly identified insulin as the treatment for T1 diabetes. Nearly 55% suggested that intake of excess sugar is the cause of T1 diabetes. More than 90% of the study participants answered only 1-5 questions correctly thus falling in the "poor knowledge" category of our study.

It was very surprising to see the underlying lack of awareness of community health workers like the ASHA, who form the link between the health system and the population, regarding type one diabetes and its causes and management considering that health education is an important aspect of early diagnosis. Seeing 86.5% of the participants unaware that T1 diabetes and T2 diabetes are two different conditions was very shocking.

As they are the front-line responders in the community, they can help in early diagnosis of type one diabetes with proper awareness of its symptoms.[17] By seeing the signs early and referring them to undergo a diagnostic test in the early stage, we can prevent the patient from going into a ketoacidotic coma.[18] Unlike type 2 diabetes which mainly affects adults, T1DM is more common in children and young adults of any age with peak incidences around ages 4-7 and 10-14.[19] This calls for increased community and family support in managing their condition and administering insulin daily. Uneducated families in rural areas and villages can benefit immensely from the assistance and counsel of a trained ASHA worker who is educated in this regard. In a unique country like India with varied socio-economic and cultural diversity and where specialist care is scarce, ASHA workers can counsel the family and support them.[20] They can also bust myths about medical concerns like T1DM. Several misconceptions, superstitions, and high rates of illiteracy in rural India, further emphasizes the need for ASHA/CHW intervention.[21] The families that come from a lower-socio economic background face a multitude of challenges every day grappling with uncertainty on how to manage hypoglycaemia and hyperglycaemia.[22] Along with the huge financial burden they face, management of their child's condition is a particularly challenging task.[23] They need emotional and social support and the guidance of someone who has the knowledge of T1 diabetes.[24] The ASHA workers seem to be the best fit to ensure welfare of those diagnosed with T1DM in rural areas where access to specialist care is limited.

Considering the increase in T1 diabetes cases, the ASHA education modules need to be updated to increase focus

on non-communicable diseases with a special focus on auto-immune diseases, especially in the post-COVID-19 era.[225,26] If the ASHA are educated first, they can create a domino-effect and educate the community about the signs and symptoms of T1DM.

The study has various strengths. The 156-person sample size offers a statistically significant yet manageable cohort for evaluating the knowledge levels of ASHA/CHWs. ASHAs are vital frontline healthcare professionals in the community, and their knowledge of T1DM directly affects diabetes treatment, early detection, and awareness. The study's findings may have beneficial ramifications and guide focused training initiatives to raise the proficiency and efficacy of ASHA employees, thereby improving type one diabetes care in the underprivileged communities. It is also one of its kind, piloting the study of T1DM knowledge among CHWs and ASHA workers.

The study poses a few limitations as well. Although the sample size is sufficient for preliminary analysis, it might not fully represent the diversity of ASHA workers' various geographic areas, which would restrict how broadly the results can be applied.

The present study noticed a significant gap in the existing literature regarding type 1 diabetes and the role of community health worker interventions. A huge majority of the studies currently available have assessed the knowledge of ASHA or community health workers on type two diabetes.

There are quite a few studies highlighting the importance and effect of educational interventions on CHWs and their ability to improve type 2 diabetes knowledge and management in rural settings.

For example, a study in Karnataka's Udupi district, found significant improvement in ASHA workers' knowledge of diabetes following an awareness program, with 46.7% demonstrating good knowledge post-intervention.[27] Some studies show the effect of intervention. Researchers, Vishakha et al assessed the effect of CHW intervention on a rural community in central India which showed that the intervention group showed a reduction mean HbA1c levels and showed glycemic index improvement than compared to the control group.[28] Another study by Anirudh et al in rural south India found that a vast majority of study participants had insufficient knowledge on T2 diabetes. [29]

So far, we have not found any study, in particular, that assesses the knowledge of type one diabetes in grassroot level or community-based health programs. Hence, this is a unique pilot study that dives into assessing the community health workers' knowledge on type one diabetes mellitus specifically. Although it cannot be prevented, it is crucial for CHWs or ASHA workers to receive adequate training to identify symptoms of type 1 diabetes, recognize high or low blood glucose levels, and facilitate early diagnosis, especially in children. There is considerable potential for future research focusing on community-based and educational interventions to address this gap.

CONCLUSION

This study highlighted the critical need for awareness programs and capacity-building initiatives for community health workers or ASHAs to address the growing burden of type 1 diabetes (T1D). As grassroots health facilitators, it can prove beneficial to integrate T1D knowledge into the ASHA curriculum to support early diagnosis and treatment. The implementation of a nationwide T1D capacity-building program for ASHA workers or CHWs might lead to a significant increase in diagnosed cases and could help prevent complications arising from late diagnosis, insufficient diabetes education, and lack of symptom awareness. Community-based interventions and educational initiatives for grassroots health workers need to be prioritized to enhance the overall management of T1D.

ACKNOWLEDGEMENTS

We sincerely thank the ASHA workers who participated in the study and answered the questionnaire. We also express our gratitude to the coordinators at the PHCs and local health officials for their support during data collection.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee of Sri Siddhartha Institute of Medical Sciences and Research Centre, T. Begur

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Cite this article as: Uthkarsha D, Gavisiddaiah SH, Uthkarsh PS. Assessment of the knowledge of community health workers about type 1 diabetes mellitus: a cross-sectional study from rural Karnataka. Int J Community Med Public Health 2025;12:3247-53.