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ORIGINAL ARTICLE

Practice of complementary and alternative medicine use in North Indian children with type 1 diabetes: an exploratory study

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Abstract

Purpose Intermittent or concurrent use of Complementary and Alternative medicines (CAM) with insulin may have adverse effects in children with Type 1 Diabetes (T1DM). This study explores the practices of CAM use in children with T1DM.

Methods An exploratory study was conducted among parents of children with T1DM attending a tertiary-level diabetes clinic. Data were collected using a structured pre-tested questionnaire.

Results Two-hundred parents were invited; 183 (91.5%) completed the study. The mean age of the children was lower among CAM users than others (7.9 ± 4.3 vs 9.3 ± 4.3 years, *p* 0.032). The two groups were similar in gender, family income, parental education, and age at diagnosis. Sixty-seven (36.6%) had used CAM. The parents' reasoning for CAM use was to cure diabetes (62.7%), to improve glycemic control (28.3%), or considering it harmless (17.9%). The most commonly used CAMs were Ayurveda (32.8%) and homeopathic preparations (31.3%). The time interval between diagnosis and CAM use ranged from 1 day to 4 years. The duration of CAM use varied widely; 50.7% used CAM for < 1 month. Only 10 CAM users had HbA1C estimated during CAM use; their mean HbA1C was 12.4 ± 3.6%. Twenty-seven CAM users (40.2%) reported poorer glycemic control; 26.8% had no effect, and the rest had undefined effects due to too short duration of use.

Conclusion CAM, mostly herbal, is frequently used among children with T1DM in North India and has detrimental effects on glycemic control. This information should be used during diabetes education to avoid medical emergencies related to sub-optimal insulin dosing.

Keywords Type 1 diabetes · Complementary and alternative medicine · Practices · Children · Glycemic control

Introduction

Type 1 Diabetes (T1DM) is a chronic metabolic disorder that is mostly diagnosed in childhood [1]. According to the 2019 IDF atlas, India is leading the world in the number of new T1DM cases, and adds more than 20,000 new cases every year in the age group 0–19 years [2]. The National Center of Complementary and Alternative Medicine (NCCAM) has defined Complementary and Alternative medicine (CAM) as "a group of diverse medical and health care systems, practices and products that are presently not considered to be part of conventional medicine" [3–5].

Increased use of CAM has been observed in individuals with chronic non-life-threatening diseases [6]. In patients with diabetes, a wide variation in prevalence and type of CAM use has been identified previously [7]. Among children with T1DM, CAM is often used by their families in a belief to decrease blood glucose levels and diabetes-related complications, to improve general health, and to obtain psychological relief and relaxation; it is thought that CAM is beneficial with lesser side effects compared to allopathic medicines [8–12].

The self-administration of both conventional medicines and CAM without disclosure of CAM use to healthcare professionals may result in ineffective diabetes management and adverse effects [7, 13, 14].

Despite the common use of CAMs in T1DM, there is limited research and reports on this practice equally from

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all regions of the world; most reports on CAM use emanate from the American and European continents [1, 8–12, 14]. In the Indian context, CAM use in children with T1DM has not been reported even though the practice appears to be common for other disorders, including T2D [15–17]. There are, however, isolated case reports on harmful effects of CAMs in Indian children with T1DM [18, 19]. In our region, the use of CAMs is common in adults with chronic conditions, specifically in patients belonging to low educational and socio-economic status [20].

A majority of children with T1DM who visit our hospital belong to families with low educational and income status, a background that appears to be a driving force for CAM use due to several reasons [21]. We, therefore, feel that CAM use could be common in our patients, but its formal assessment has never been undertaken. In the present study, we aimed to quantify the usage of CAM among children with T1DM and explore the reasons behind its use.

Materials and methods

All parents of children with T1DM attending the Diabetes Clinic of our tertiary care pediatric center located in Northwest India were invited to participate in this study. A structured questionnaire on the use of CAM among children with T1D was developed for this study. The questionnaire was first pilot tested on ten patients for validity and feasibility evaluation. Data were collected using this pre-tested questionnaire by direct interview method. Both the parents were interviewed together; else, the available parent was interviewed. The questionnaire had two sections; first, the socio-demographic profile, which included basic details such as identification data of the child (age and gender of child), duration of diabetes, co-morbidities in the child, previous medicines taken for diabetes, parental education, family income, and second on CAM practice details which had items on use of CAM for diabetes or any other ailments by the family. It also included details about how and where they procured the CAM. The data on glycemic control were extracted from the clinic files and parental interviewing.

Statistical analysis

Data were entered and analyzed using SPSS or Windows, version 22.0 (IBM Corp., Armonk, N.Y., USA). The data were described in terms of frequencies and percentages. The inferential analysis was done using Pearson's correlation for parametric and Spearman's test for non-parametric variables. A p value of less than 0.05 was considered statistically significant.

Ethical considerations

The study protocol conformed to the ethical guidelines of the Declaration of Helsinki (2013). Prior permission was obtained from the Institute Ethics Committee (INT/IEC/2021/SPL-1511, dated 21-10-2021). A written informed consent was taken from the parents before their participation in the study.

Results

Parents of 200 children with T1DM were invited to participate, and 183 completed the study. Table 1 compares the patient characteristics and socio-demographic profile of the participants. The mean age of the children at enrollment was lower among CAM users than the non-CAM users (7.9 ± 4.3 vs 9.3 ± 4.3, p 0.032. The two groups were similar in terms of gender distribution, family income, highest parental education as well as the age of the child at diagnosis. Most of the children were on basal-bolus insulin regimen (180, 98.4%) using insulin pens, and the rest were on a split-mix regimen using insulin syringes (3, 1.6%). None of the participants were using insulin pumps. Only ten (14.9%) of the CAM users had an HbA1C done during the CAM use period, and the rest had not got their HbA1C tested as they were not on regular follow-ups with any physician. The mean HbA1C among these children was 12.4 ± 3.6%. Table 2 describes the various CAMs used among children with T1DM. Out of the total, 67 (36.6%) participants had used CAM in their child for diabetes at least once. Out of these, 15 (22.4%) had used more than two types of CAM, and 3 (4.5%) had used more than three types of CAM. The most commonly used CAM were Ayurvedic (32.8%), homeopathic (31.3%), bitter gourd (19.4%), *jamun* (Indian Blackberry/Java Plum) (14.9%), and fenugreek (11.9%). Among the CAM users ($n = 67$), a small number of children had used CAM prior to insulin initiation (10, 14.9%), and a larger number had used CAM after insulin initiation (57, 85.1%). At the time of the interview for this study, 12 children (17.9%) were using CAM: only 4 of them reported having informed their clinician about it. Among all the participants, very few (29, 15.8%) participants had discussed using CAM with their clinician.

The time interval between diagnosis and the first use of CAM ranged from 1 day to 4 years. Similarly, the duration of use of CAM was wide, ranging from once only to 2 years. Half of the participants had used CAM for less than a month (34, 50.7%). None of the participants reported any major advantage/benefit or serious adverse events while using CAM. The minor problems that they

Table 1 Patient characteristics and socio-demographic profile of the participants

Variable	CAM users ($n=67$)	Non CAM users ($n=116$)	p value
Age of child at enrollment (mean ± SD) (years)	9.3 ± 4.3	7.9 ± 4.3	0.032*
Gender of child			
Male	35 (52.2)	51 (44)	0.287
Female	32 (47.8)	65 (56)	
Family income per month			
Less than 20,000	44 (65.7)	82 (70.7)	0.576
20–50,000	14 (20.9)	24 (20.7)	
More than 50,000	9 (13.4)	10 (8.6)	
Highest education among parents			
Illiterate	3 (4.5)	7 (6)	0.556
Literate	2 (3)	9 (7.8)	
Primary school	14 (20.9)	14 (12.1)	
Middle school	17 (25.4)	26 (22.4)	
High school	12 (17.9)	20 (17.2)	
Intermediate/diploma	18 (26.9)	39 (33.6)	
Graduate/post graduate	1 (1.5)	1 (0.9)	
Age at diagnosis			
Less than 1 year	1 (1.5)	1 (0.9)	0.906
1–5 years	18 (26.9)	37 (31.9)	
5–10 years	16 (44.8)	47 (40.5)	
10–15 years	30 (23.9)	29 (25)	
More than 15 years	2 (3)	2 (1.7)	
Duration of diagnosis			
0 Days to 1 month	15 (22.4)	46 (39.7)	0.007
1–6 months	9 (13.4)	32 (27.6)	
6 months–1 year	16 (23.9)	12 (10.3)	
1–2 years	6 (9)	6 (5.2)	
2–5 years	7 (10.4)	8 (6.9)	
5–10 years	12 (17.9)	10 (8.6)	
10–15 years	2 (3)	2 (1.7)	
Insulin regimen			
Basal bolus	64 (95.5)	116 (100)	0.048
Split mix	3 (4.5)	–	

*Significant

faced made them stop CAM use. A detailed explanation of the side effects is presented later in this section. Further, among the CAM users, 27 (40.2%) reported poorer glycemic control as their blood glucose readings went higher than before during CAM use, 18 (26.8%) had no effect on the blood glucose readings and overall glycemic control, and the rest (22, 32.8%) had used CAM only once or twice, and hence the effect on glycemic control was not defined.

A few parents (11, 16.4%) had no knowledge about the ingredients or composition of the CAM prescribed by the alternative healthcare practitioner. Among the 31 (16.9%) out of the total 183 participants who reported using CAM in their children for conditions other than diabetes, use of homeopathy (16.1%) and '*desi dawai*' (a local name for unspecified medicine; may have herbal, metallic components or both) (12.9%) were most common (Table 3). Other conditions included low platelet count related to dengue fever, common cold, ear infection, cough, etc. Twenty-eight participants (15.3%) had visited an alternative healthcare professional in the past 3 months; 23 (12.5%) for seeking treatment of diabetes, 2 (1.1%) for celiac disease, and 3 (1.6%) for other minor health ailments.

On the question of who suggested CAM, most parents (44, 65.7%) reported using CAM in their child following the advice of their close friends, neighbors, or relatives. Few parents (7, 14%) followed recommendations on social media

Table 2 Type of CAM used among children with T1DM ($n=67$)

CAM category	CAM name	*n*	%
Alternative medical system	Ayurvedic	22	32.8
	IME-9 tablet	1	1.5
	Homeopathy	21	31.3
	Desi dawai	7	10.4
	Yoga	1	1.5
Natural sources (plant origin, $n=70$)-vegetable	Bitter Gourd	13	19.4
	Dipping feet in bitter gourd water	1	1.5
	Kaddu/kashmal	1	1.5
	Lady's finger water	1	1.5
	Raw brinjal	1	1.5
Natural sources (plant origin)-fruit	Lemon	1	1.5
	Indian Gooseberry	1	1.5
	Paneer doda	1	1.5
	Dried Mango	1	1.5
Natural sources (plant origin)-bark	*Dalchini* (Cinnamon)	3	4.5
Natural sources (plant origin)-leaves	Aloe vera	3	4.5
	Wheat grass	1	1.5
	Unknown leaf	1	1.5
	Tulsi leaves	2	3
	Stevia	2	3
	Neem	3	4.5
	Giloy (Tinospora cordifolia) leaves	4	6
	Sugar free leaf	2	3
	Gurmar patta (Gymnema sylvestre)	1	1.5
	*Pudina (*Mint)	1	1.5
	Wheat grass	1	1.5
Natural sources (plant origin)-seeds	*Ajwain* (carom seed)	3	4.5
	Saunf (fennel seed)	2	3
	Laung (cloves)	1	1.5
	Indra Jao (Conessi tree)	1	1.5
	Methi seed/ methi water (fenugreek)	8	11.9
	Alsi (flax seeds)	1	1.5
	Jamun (blackberry) (as powder, juice, or vinegar)	10	14.9
	Kale jau (black barley)	1	1.5
Natural sources (plant origin)-root	Haldi	1	1.5
Natural sources (plant origin)-flower	Gulbahar	1	1.5
Natural sources (animal origin)	Goat milk	**1**	1.5
Spiritual therapy	Prayers	2	3
	Holy thread in neck	2	3
Unspecified		11	16.4

and internet, parents of children with diabetes (6, 8.9%), an allopathic doctor (2, 3%), Ayurveda doctor (2, 3%), and a nurse (1, 1.5%). Only five (7.5%) had started CAM without advice from others.

Parents reported different sources of CAM procurement. Mostly, the CAM was provided by the alternative healthcare practitioner (35, 52.2%). Other parents reported getting the CAM from its natural source (22, 32.8%), purchasing it from a CAM-specific outlet (14, 20.9%), or a health food store (12, 17.9%).

Regarding the expectation from using CAM, some parents stated more than one reason. Forty-two (62.7%) stated that they started using CAM with the faith that it would cure diabetes in their child. Others (19, 28.3%) used it to gain more control over blood glucose values or because they considered it harmless (12, 17.9%), inexpensive to give a try

Table 3 CAM used for any medical conditions (other than diabetes) ($n=31$)

CAM category	CAM used	*n*	%	Reason to use
Alternative medical system	Ayurvedic	1		Bed wetting
	Homeopathy	5	16.1	Irritability, wheat allergy, fever, height gain, bed wetting, hernia, polyuria
	Desi dawai	4	12.9	Bed wetting, Jaundice, wheat allergy
Natural sources (plant origin)-leaves	*Giloy* (Tinospora cordifolia) leaves	3	9.7	Low platelet count, to increase immunity
	Papaya leaves	2	6.4	Low platelet count, dengue
	Aloe vera	2	6.4	Dengue, fitness
Natural sources (plant origin)-vegetables	Gourd juice	1	3.2	For fitness
	Onion juice	1	3.2	Vomiting
	Lemon in water	1	3.2	Polyuria
	Ginger	1	3.2	Cough, cold
Natural sources (plant origin)-spices	*Laung* (cloves)	2	6.4	Cough, cold
	Ilaichi (cardamom)	2	6.4	Cough, cold
	Triphala (*Polyherbal remedy*)	1	3.2	Ear infection
	Hing (Asafetida)	1	3.2	Abdominal pain
Natural sources (animal origin)	Honey	1	3.2	Cough and cold
	Goat milk	1	3.2	Low platelet count
Unspecified		2	6.4	Wheat allergy, Tonsillitis, fever, cold

(2, 3%), to stop insulin injections (6, 8.9%), to cure bed-wetting in their child (2, 3%), during the COVID-19 pandemic when they faced restrictions in traveling to their physician (1, 1.5%), and for overall health improvement (1, 1.5%).

The parents were asked the reasons for stopping CAM use in their child. These reasons also include the minor harms or side effects that they felt while using CAM. Almost half of them (32, 47.7%) reportedly stopped using CAM as it did not improve glycemic control. Others had stopped because the child became too sick (18, 26.9%), or refused to continue the CAM (14, 20.9%). Some had stopped using CAM due to the non-availability of the CAM substance (2, 3%), or due to difficulty in complying with it (1, 1.5%). However, none of the participants reported any serious adverse events requiring hospitalization following any CAM use. Minor but common problems observed during CAM use were abdominal pain (2, 3%), diarrhea (1, 1.5%), dehydration (1, 1.5%), weakness (1, 1.5%), giddiness (1, 1.5%), cough/cold (1, 1.5%), reduced growth (1, 1.5%), and hypoglycemia (1, 1.5%).

The parents were asked whether they would use CAM in their child with T1DM in the future if their physician recommended it. Half of them (95, 51.9%) refused, and the rest either said yes (65, 35.5%) or were not sure (23, 12.6%). Among the ones who had used CAM at least once ($n=67$), nearly half (29, 43.3%) said yes to trying CAM again in the future, and some (10, 15%) were still not sure.

For inferential analysis, CAM use was compared to various socio-demographic and clinical variables. Only a weak negative correlation was seen between CAM use with the age of the child (− 0.159, p 0.032) and duration of illness (− 0.252, p 0.001). The CAM use was not related to gender, parental education, income, and age at diagnosis.

Discussion

In this study conducted at a tertiary-level pediatric diabetes clinic, CAM use among children with T1DM was found to be around 36%. None of the participants reported any benefit or advantage of using CAM for T1D. Also, there were no major adverse events while using CAM, although some minor side effects were reported, which became the reason to stop CAM use. This is lower than the pooled prevalence of CAM usage among persons with diabetes, as reported in a recent meta-analysis [7]. Usage of CAM therapy has been reported from various parts of the world among children with T1DM [8–12] as well as adults with diabetes [7, 22–28]. CAM use has been reported previously from the southern part of India among adults with T2D [16, 17], but data on CAM use among children with T1DM is missing. Ours is probably the first study to describe CAM usage in this population from this region. The data reveal that a higher number of newly diagnosed children (duration of diagnosis upto 6 months) had not used any CAM product at the time of data collection. This means that the initial diabetes education and counseling is an appropriate opportunity to emphasize the importance of insulin in T1D among children. The results of this study provide evidence that can be used to explain to the parents that the CAM tried by participants in this study has shown no improvement

in glycemic control, and some have even experienced side effects from these products. Further, as the duration of CAM use was lesser than a month in many cases (50.7%), it is difficult to comment on the long term effects of CAM use among these children.

Different studies have reported different CAM therapies to be more prevalent than others. It is difficult to rank which is the most popular CAM being used among children with T1DM worldwide. When looking at the reason to use a particular CAM, easy accessibility and local availability of the CAM in that region [25, 26] or lower cost than the conventional treatment has been reported [25]. Further, an inclination toward herbal remedies using indigenous plants can be seen in the Central and South-Asian region [9, 12, 13, 25–27], whereas studies from America and Europe show a higher prevalence of faith and traditional healing practices, spiritual practices, and solitary prayers supplementing the conventional treatment for diabetes [22, 28].

Interestingly, the motivation for CAM use remains almost similar across all regions in the present study as other previous studies; it was considered safe and free of side effects [8], it was inexpensive to give a try [8, 25], for better glycemic control [12, 14, 24, 26], and for overall health improvement [8, 23]. Dissatisfaction with conventional treatment has often been reported [16] due to the occurrence of diabetes-related complications despite regular treatment [14, 25, 26] and high cost [26]. Also, similar to the present study results, it has been reported previously that few participants had informed about CAM use to their diabetes specialist [7, 28]. This is also supported by the results of our study, as half of the CAM users still intended to use CAM in the future despite a well-established and extensive diabetes education program at our center [29–32].

This study has a few limitations. This was a cross-sectional survey at a single centre, so the findings cannot be generalized to different regions. Recall bias is possible in such surveys exploring previous practices of CAM use, although the data regarding glycemic control during CAM was verified from past medical records, where available. Also, the actual prevalence of CAM use may be higher due to a tendency to hide such information from the diabetes specialist [7, 28] or more (71%) participants within 1 year of diagnosis who were not yet exposed to sources of information on CAM use but might be convinced to use it in future. Nevertheless, this study warrants closer communication and better rapport among the diabetes specialists and parents of children with diabetes to prevent the use of CAM among these children. Even if there were no major side effects reported among any of the participants, the results show that none of the children had any improvement in glycemic control by using CAM alongside or as a stand-alone treatment. Further, the HbA1C of the CAM users was much higher than the population-mean HbA1C of our Pediatric Diabetes Clinic ($12.4 \pm 3.6\%$ vs $7.96 \pm 1.46\%$) [21, 33]. Thus, there should not be a situation where people rely on traditional medicine to discontinue insulin therapy and put their children in harm's way. We suggest larger studies in different regions of our country to further understand the patterns and effects of CAM use in children with T1DM.

Conclusions

This study shows that CAM therapies are frequently used among children with T1DM in North India, and Ayurveda (herbal medicines) are the most commonly used as a stand-alone treatment or as a supplement to insulin, mostly with an expectation of a permanent cure. The study results also indicate that CAM use was associated with poor glycemic control among children with T1D compared to those who strictly use insulin only. The study helps us to understand the role of CAM in our region and lays a foundation for further interventions required to guide parents about CAM during diabetes education given to all such families.

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Data availability All data related to the study will be available upon reasonable request.

Declarations

Conflict of interest No conflict of interest for any of the authors.

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Informed consent All procedures followed were in accordance with the ethical standards of the Institutional Ethics Committee and with the Helsinki Declaration of 1964 and later versions. A prior, written informed consent was obtained from all patients for being included in the study.

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