

# Physician's perceived barriers to millet-based diet in clinical practice: A cross-sectional survey

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## Abstract

**Objectives:** This study aimed to investigate the perceived barriers faced by physicians in Maharashtra when recommending a millet-based diet for diabetic patients. The objectives were to identify the challenges physicians encounter in promoting millet consumption, assess their knowledge and beliefs about millet-based diets, and evaluate the current resources and practices used in dietary counseling for diabetes management. **Methods:** A cross-sectional survey was conducted among 68 physicians specializing in diabetes care in Maharashtra. Participants were recruited using snowball sampling and met the inclusion criteria of having over 10 years of clinical practice and significant experience in diabetes management. Data collection was performed through a pre-tested survey tool distributed through email and Google Forms. The survey included questions on the effectiveness of millet-based diets, patient characteristics influencing dietary recommendations, barriers to providing millet-based food education, and current and desired resources for promoting such diets. Ethical approval was obtained, and informed consent was secured from all participants. **Results:** The survey revealed that 70.59% of physicians considered a millet-based diet significantly effective for lowering blood sugar levels. However, several barriers were identified, including high comorbidities (82.35%) and low income (54.41%) among patients, which hindered dietary recommendations. In addition, physicians reported a lack of formal training in millet-based nutrition (73.53%), personal skepticism toward millet-based diets (63.23%), and insufficient patient educational resources (55.89%). Current resources used for dietary counseling were primarily verbal education (100%) and electronic resources (97.06%). **Conclusion:** Despite recognizing the potential benefits of millet-based diets, physicians face substantial barriers in recommending them to diabetic patients. These barriers include factors such as lack of training, time, and educational resources. To overcome these challenges, there is a need for enhanced educational programs for physicians, increased availability of patient-friendly educational materials, and access to trained dietitians. Implementing these measures could improve dietary management strategies and health outcomes for diabetic patients.

**Keywords:** Diabetes mellitus, Diet, Millet, Physicians, India

## 1. INTRODUCTION

Diabetes mellitus is a global public health concern, affecting millions of individuals and significantly contributing to morbidity and mortality rates. In India, the prevalence of diabetes is rapidly increasing, posing a substantial burden on the health-care system. Effective management of diabetes primarily involves lifestyle modifications, including diet control, physical activity, and medication adherence [1]. Diet control, in particular, plays a crucial role in maintaining blood glucose levels within the target range, thus preventing complications associated with diabetes [2]. Millets, a group of small-seeded grasses, are gaining attention as a potential dietary intervention for diabetic patients. They are rich in fiber

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and essential minerals, and have a low glycemic index, which helps in managing blood glucose levels effectively [3]. Despite these benefits, the utilization of millet in the diets of diabetic patients remains limited. Understanding the barriers to millet consumption from the perspective of health-care providers is essential to promote its use and improve dietary management in diabetes. Diet control is a cornerstone in diabetes management. It involves the regulation of carbohydrate intake to maintain optimal blood glucose levels and prevent hyperglycemia [4]. Carbohydrate quality, rather than quantity, has a significant impact on glycemic control. Foods with a low glycemic index such as millets, release glucose slowly into the bloodstream, thereby preventing rapid spikes in blood sugar levels [5]. Incorporating millets into the diet of diabetic patients can provide numerous health benefits, including improved glycemic control, enhanced satiety, and reduced risk of cardiovascular diseases [6]. Millets are nutritionally superior to many commonly consumed grains such as rice and wheat. They are high in dietary fiber, which aids in digestion and promotes a feeling of fullness, reducing overall calorie intake [7]. Millets are also rich in essential minerals such as magnesium, phosphorus, and iron, which are beneficial for overall health and particularly important for individuals with diabetes [8]. In addition, the antioxidants present in millets help in reducing oxidative stress and inflammation [9], which are common complications associated with diabetes. Despite these advantages, several barriers hinder the widespread adoption of millets in the diets of diabetic patients. These barriers can be broadly categorized into patient-related factors, physician-related factors, and systemic factors. From a patient perspective, lack of awareness, cultural preferences, and taste preferences often pose significant challenges [10]. However, physician-related factors also play a crucial role in influencing dietary recommendations. The purpose of this study is to explore the perceived barriers to using millets among diabetic patients from the perspective of physicians dealing with diabetic cases across Maharashtra. This cross-sectional study aims to gather insights into the challenges and reservations that physicians encounter when recommending millets to their patients. Identifying these barriers can inform the development of targeted interventions to promote millet consumption and enhance diet-based diabetes management strategies. Physicians, being the primary source of medical advice for diabetic patients, significantly influence their dietary choices. However, various barriers can affect physicians' willingness and ability to recommend millets. These barriers may include a lack of knowledge or familiarity with millets, concerns about patient compliance, perceived difficulties in dietary counseling, and time constraints during consultations [11]. Understanding these barriers from the physicians' perspective is essential for developing strategies to promote millet use among diabetic patients. This study

aims to fill the gap in knowledge regarding physician-perceived barriers to recommending millets in Maharashtra. By conducting a cross-sectional survey among physicians dealing with diabetic cases, this study will provide valuable insights into the challenges faced by health-care providers in incorporating millets into dietary recommendations. The findings of this study will contribute to the development of targeted interventions to promote the use of millets, thereby improving dietary management and overall health outcomes for diabetic patients.

## 2. MATERIALS AND METHODS

This cross-sectional survey study aimed to explore health-care providers' perceptions and practices regarding the adoption of a millet-based diet as an adjunct to medications for managing blood sugar levels. Ethical clearance was obtained from the Ethics Committee of NIN, Pune. The study utilized snowball sampling to recruit participants, ensuring a diverse and experienced pool of respondents. Initial participants, who met the inclusion criteria of having more than 10 years of clinical practice after obtaining their MD Medicine or DNB degree and significant experience in diabetes care, were asked to refer other eligible colleagues. Out of 96 distributed surveys, 28 were incomplete and excluded from the analysis, resulting in a final sample size of 68 complete and usable responses. Data were collected using a pre-tested survey tool form that included questions on the effectiveness of millet-based diets, patient characteristics affecting dietary recommendations, barriers to providing millet-based food education, and current and desired resources for promoting such diets. The survey was distributed through email and Google Forms, with multiple reminders sent to maximize response rates. Ethical clearance was obtained from the National Institute of Naturopathy, Pune, Maharashtra, and informed consent was secured from all participants. The study was conducted over 6 months, starting from November 2023, allowing for comprehensive data collection and follow-ups with respondents.

## 3. RESULTS

The dropout rate for the survey was 29.17%, as 28 out of the initial 96 participants did not complete it. The survey results reveal several insights into the effectiveness and barriers of prescribing a millet-based diet for lowering blood sugar levels (Table 1). The majority of respondents (70.59%) consider a complete millet-based diet significantly effective as an adjunct to medications. However, certain patient characteristics deter clinicians from recommending this diet, such as high comorbidities (82.35%) and very high sugar levels (73.53%). Several barriers hinder the provision of millet-based diet education, including a lack of formal training (73.53%),

**Table 1. Survey questions and responses (n%)**

Question	Significantly ineffective	A little less effective	About as effective	A little more effective	Significantly effective	Total
How effective do you believe shifting to a complete millet-based diet is essential to lowering blood sugar levels as an adjunct to medications (%)	0 (0)	0 (0)	0 (0)	20 (29.41)	48 (70.59)	68 (100)
			Not a factor (%)	Minor factor (%)	Somewhat significant (%)	Very significant factor (%)
Patient characteristic which makes you less likely to prescribe a totally millet-based diet						
Low income			37 (54.41)	2 (2.94)	13 (19.11)	22 (32.35)
Lack of familial support			12 (17.65)	35 (51.47)	5 (7.36)	16 (23.53)
Low diet literacy			20 (29.41)	20 (29.41)	10 (14.70)	18 (26.47)
Very high sugar levels, so diet may not be an effective option			50 (73.53)	18 (26.54)	0 (0)	0 (0)
High co-morbidities/complexities			56 (82.35)	12 (17.65)	0 (0)	0 (0)
Perceived low ability of patients to stick to the diet pattern			0 (0)	3 (4.41)	0 (0)	65 (95.59)
What barriers do you face in clinical practice that prevent you from providing millet-based food education to the patients?						
Personal lack of belief in millet-based food			23 (33.82)	43 (63.23)	2 (2.94)	0 (0)
Lack of formal training in millet-based food			50 (73.53)	18 (26.54)	0 (0)	0 (0)
Lack of a dietician to whom the patients can be referred			14 (20.59)	19 (27.94)	29 (42.65)	6 (8.82)
Lack of patient-related educational resources			10 (14.71)	20 (29.41)	38 (55.89)	0 (0)
Lack of time for health education			0 (0)	6 (8.82)	40 (58.83)	22 (32.35)
				Rarely (%)	Occasionally (%)	Frequently (%)
What resources do you currently use to recommend a total millet-based diet, if any?						
Verbal education, face-to-face during visits				0 (0)	68 (100)	0 (0)
Electronic resources				2 (2.94)	66 (97.06)	0 (0)
Dietitian				0 (0)	60 (88.23)	8 (11.77)
Printed materials available on my clinic or hospital websites				68 (100)	0 (0)	0 (0)
Other websites				0 (0)	68 (0)	0 (0)
Materials that I have personally collected or prepared for education				34 (50)	34 (50)	0 (0)
<b>What resources would you find useful to provide a millet-based diet and other lifestyle-based changes?</b>						
			Not useful (%)	Somewhat useful (%)	Very useful (%)	
Additional training			0 (0)	19 (27.94)	49 (72.06)	
List of good websites			0 (0)	0 (0)	68 (100)	
Printed materials to be handed over to the patients			0 (0)	42 (61.76)	26 (38.23)	
Access to a well-trained dietician			10 (14.71)	30 (44.11)	28 (41.18)	
Tailor-made electronic resources for patient education			0 (0)	34 (50)	34 (50)	
			Not appropriate (%)	Somewhat inappropriate (%)	Somewhat appropriate (%)	Very appropriate (%)
How appropriate are the following procedures for implementing millet education for eligible patients in your clinical practice						
All at-risk, pre-diabetic, and diabetic patients are referred to health-care providers or family physicians to specifically discuss about millet diet	0 (0)	0 (0)	20 (29.41)	48 (70.59)		
All at-risk, pre-diabetic, and diabetic patients receive referrals to trained dietitians for further sessions	0 (0)	0 (0)	20 (29.41)	48 (70.59)		
All at-risk, pre-diabetic, and diabetic patients receive a brief about the millet diet and printed material on the first visit	0 (0)	11 (16.18)	25 (36.76)	32 (47.06)		
All at-risk, pre-diabetic, and diabetic patients along with their caretakers are provided hands-on related to millet-based food	12 (17.65)	10 (14.71)	22 (32.35)	24 (35.29)		

NA: Not available.

insufficient belief in millet-based food (33.82%), and lack of a dietician (42.65%). In addition, time constraints (58.83%) and the absence of patient-related educational resources (55.89%) also pose significant challenges. At present, the most utilized resources for recommending a millet-based diet are

printed materials (100%) and verbal education during visits (100%). However, clinicians expressed a need for additional training (72.06%), a list of good websites (100%), and tailored electronic resources (50%). For implementing millet education, referring all at-risk, pre-diabetic, and diabetic

patients to health-care providers or dietitians was deemed very appropriate by 70.59% of respondents.

#### 4. DISCUSSION

The survey results provide valuable insights into the perceptions and practices of health-care providers regarding the adoption of a millet-based diet as an adjunct to medications for lowering blood sugar levels. An overwhelming majority (70.59%) of respondents believe that a complete millet-based diet is significantly effective, with the remaining 29.41% considering it a little more effective. This finding aligns with existing literature that highlights the potential benefits of millet in glycemic control due to its high fiber content and low glycemic index [3,12]. Despite the positive perception of millet-based diets, several patient characteristics impact the likelihood of prescribing such a diet. Low income (54.41%) and high comorbidities (82.35%) are significant deterrents. High comorbidities often complicate dietary interventions due to the complex interplay of various health issues, making it challenging for patients to adhere to strict dietary regimens [13]. Furthermore, the perceived low ability of patients to stick to the diet pattern (95.59%) underscores the necessity for comprehensive support systems to ensure adherence. Barriers faced by health-care providers in promoting millet-based diets are notable. A significant lack of formal training (73.53%) and personal belief in millet-based foods (63.23%) highlight an urgent need for enhanced educational programs. In addition, the absence of dietitians to refer patients (42.65%) and insufficient patient educational resources (55.89%) further compound these challenges. These barriers are consistent with findings from previous studies that emphasize the importance of provider education and resource availability in the effective implementation of dietary interventions [14,15]. The current utilization of resources for recommending a millet-based diet is limited primarily to verbal education (100%) and electronic resources (97.06%). This suggests a gap in the availability and use of diverse educational tools, such as printed materials or specialized websites. Enhancing resource availability and diversity could improve the effectiveness of dietary recommendations. To address these challenges, respondents indicated a need for additional training (72.06%) and a comprehensive list of reliable websites (100%) as very useful resources. Access to a well-trained dietitian (41.18%) and tailored electronic resources (50%) were also considered essential. These findings underscore the necessity for multifaceted approaches involving training, reliable information sources, and professional support to promote millet-based diets effectively [16]. Implementing millet education in clinical practice was deemed very appropriate for at-risk, pre-diabetic, and diabetic patients through referrals to health-care providers (70.59%) and trained dietitians (70.59%).

However, integrating hands-on education involving patients and caregivers received mixed responses, indicating a need for tailored intervention strategies [17]. The findings from our study, where time constraints were a significant barrier to promoting millet-based foods align with similar challenges reported in the literature. The primary obstacle to counseling for 73.3% of general practitioners was identified as a lack of time in a Polish study [18]. This reflects a broader issue in health care, where nutritional advice is deprioritized due to the focus on acute care. Critically, while time constraints are recognized as a barrier, this issue also highlights a gap in the health-care system's ability to integrate comprehensive dietary counseling into routine practice. Unlike more standard nutritional advice, promoting less conventional diets requires more in-depth patient education, which is often sidelined due to time limitations [19]. A potential solution could be the integration of nutrition specialists into the health-care team, allowing physicians to focus on medical issues while ensuring that patients receive adequate dietary guidance. In addition, implementing time-efficient digital tools for patient education on millet-based foods could help overcome these constraints by providing continuous and accessible support outside the consultation room.

#### 5. CONCLUSION

The survey reveals that health-care providers generally perceive millet-based diets as a beneficial adjunct to blood sugar management, with 70.59% rating them as significantly effective. This aligns with existing evidence on millet's advantages due to its high fiber and low glycemic index. However, several barriers hinder the adoption of millet-based diets, including low income, high comorbidities, and challenges in patient adherence. Providers also face obstacles such as a lack of formal training and insufficient resources, which echo previous studies highlighting the need for better education and resource availability. Time constraints further complicate the integration of such diets into routine practice, reflecting a broader issue where nutritional advice is often deprioritized. Addressing these challenges requires enhanced training, diverse educational tools, and potentially integrating nutrition specialists into the health-care team.

##### 5.1. Limitations of the study

The study's limitations include a potential response bias due to the self-reported nature of the survey, which may affect the accuracy of the findings. The sample size (n=68) may also limit the generalizability of the results to broader populations. In addition, the survey did not explore the impact of regional dietary preferences and cultural factors on the adoption of millet-based diets, which could influence the applicability of the findings across diverse patient populations. Future

research should consider larger, more diverse samples, and include qualitative methods to explore patient and provider perspectives in more depth.

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## CONFLICT OF INTEREST

The authors declare no conflict of interest.

## AUTHOR CONTRIBUTIONS

*Conceptualization:* Shrikanth Muralidharan

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## ETHICS APPROVAL AND CONSENT TO PARTICIPATE

Ethical clearance was obtained from the Ethics Committee of NIN, Pune, India (approval no.: NIN/IECF018/07/2023).

## CONSENT FOR PUBLICATION

Not applicable.

## AVAILABILITY OF DATA

Data used in this work are available from the corresponding author upon reasonable request.

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