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A Qualitative Assessment on the Impact of Social Determinants of Health on Diet Changes in the INDIA-WORKS Study

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2021

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An abstract of
A thesis submitted to the faculty of the
Rollins School of Public Health of Emory University
in partial fulfillment of the requirements for the degree of
Master of Public Health
in Global Health
2024

Abstract

A Qualitative Assessment on the Impact of Social Determinants of Health on Diet Changes in the INDIA-WORKS Study

By: Almas Mufazzal Badani

Background: India has one of the highest prevalences of diabetes globally, posing a significant public health challenge. As a response, INDIA-WORKS was launched as a comprehensive worksite intervention program aimed reducing cardiometabolic risk factors associated among people with diabetes/prediabetes.

Problem Statement: To better assess the acceptability and impacts of the INDIA-WORKS intervention, there is a need to describe the reported uptake of diet changes and explore how gender, cultural attitudes, mental health, and social gatherings might have impacted diet changes.

Methods: Eligible participants including worksite managers, peer educators, program 'completers,' program 'dropouts,' and implementation team members participated in in-depth interviews (IDI) and focus group discussions (FGD). As part of a thematic analysis, code development for all qualitative data was conducted by the researcher team. For this analysis, we reviewed coded segments for pertinent codes, Gender, Cultural Attitudes, Social Gatherings, and Mental Health, and created thick descriptions of the coded data. Structured comparisons of the data comparing different interviewee types was done to look for variability across stakeholder groups.

Results: Cultural attitudes, mental health, social gatherings, and gender strongly influenced diet changes and motivation in INDIA-WORKS, as well as the ability to engage in the program. Intervention participants, both those who completed the program and program dropouts, reported on their personal uptake of the program and what made behavior change successful in addition to different barriers that may have negatively impacted their success in the program. Worksite managers, peer educators, INDIA-WORKS staff members, and implementation team members spoke on their experiences as well.

Conclusion: Integration of social determinants of health, such as the cultural attitudes, gender, mental health, and social gatherings shows the importance of understanding the interplay between social and environmental factors that shape the experiences of participants in the INDIA-WORKS program and how this study can be used in more populations.

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Acknowledgements

I would like to acknowledge the people who have supported me throughout the process of writing this thesis, and without whom its completion would not have been possible.

Firstly, I would like to thank the INDIA-WORKS study participants for sharing their experiences.

Secondly, thank you to my friends, family, and classmates who have always supported me in every way that they could during this process. They say it takes a village and I could not be more grateful for mine.

Finally, I would like to express my gratitude to my thesis chair, Dr. Weber. Since, she agreed to take me under her wing when I was looking for a meaningful thesis that matched my interest at the end of my first year to where I am now. She has been an unwavering rock. Learning from her through this past year about qualitative analysis and a population I identify so closely with, thank you. She made this process so incredibly easy and never doubted me, especially when I doubted myself. Her patience, kindness, positivity, and grace helped me get here. I absolutely could not have done this without her. She reminded me every day why I chose public health.

This has been a greatly impactful journey, and I couldn't have done it without my village. Thank you so much!

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Chapter I: Introduction

Introduction and rationale

India has one of the highest prevalence of diabetes in the world. According to the International Diabetes Federation, in 2021, 74 million Indians have received a diabetes diagnosis with projections of 124 million to be diagnosed by 2024 (IDF Diabetes Atlas). Individuals living in South Asia had the highest prevalence of pre-diabetes and diabetes and were more likely to have dysglycemia at a younger age, lower BMI, and waist circumference (Shen et al., 2016). Interventions aimed at improving diabetes through dietary behaviors and exercise have become increasingly vital in addressing the diabetes pandemic, particularly in regions such as India. The INDIA-WORKS intervention emerges as a promising initiative, designed to enhance dietary habits, and promote healthier lifestyles among its participants.

Traditional Indian cuisine is characterized by the prominent inclusion of white rice and a generous use of oil in cooking. Recognizing the significant role these dietary elements play in contributing to the high prevalence of diabetes among Indians, the INDIA-WORKS intervention engaged participants in finding effective methods to diminish their consumption of these foods.

However, while the intervention holds significant potential, a comprehensive understanding of its uptake and impact remains elusive. Thus, this study strives to understand the uptake of the INDIA-WORKS intervention among program users and examining its influence it had on dietary patterns. By going deeper into the multifaceted aspects of diet modification, including the role of gender, cultural attitudes, mental health, and social gatherings, this research seeks to unravel the complex mechanisms underlying dietary behavior change.

Problem Statement

There is a need to describe the reported uptake of the INDIA-WORKS intervention by program users by exploring the program's impact on diet and how gender, cultural attitudes, mental health, and social gatherings might have affected diet changes.

Purpose Statement

The purpose of this paper is to describe the perceptions of diet intervention among program users (participants, worksite managers, peer educations, program staff, and study drop-outs) through a qualitative analysis.

Significance Statement:

Understanding the uptake of the INDIA-WORKS intervention among program users and its impact on dietary behaviors is crucial. This research delves into the intricate dynamics of diet modification by considering the interplay of gender, cultural attitudes, mental health, and social interactions. This paper contributes to enhancing the effectiveness of the intervention but also provides valuable insights into addressing broader strategies for addressing dietary challenges within diverse cultural contexts.

Chapter I: Literature Review

Diabetes and Prediabetes

Prediabetes and diabetes are part of a global pandemic where prevalence is rapidly increasing from year to year and is an urgent clinical priority. In 2021 about 537 million people globally had diabetes with projections to rise to 643 million in 2030. Additionally, in 2021, 6.7 million deaths were related to diabetes (IDF Diabetes Atlas). Prediabetes is an intermediate stage between normal glycemic levels and hyperglycemic levels that lead to diabetes and is an indicator for early detection of diabetes. Many individuals diagnosed with pre-diabetes have a high chance of developing type 2 diabetes in their life (Hostalek et al., 2015). Prediabetes affects about 298 million people globally and is projected to increase to 414 million in 2045 (Lynch et al., 2012).

Risk factors for pre-diabetes include obesity, hypertension, hypertriglyceridemia, low HDL levels, and abnormal glucose metabolism (Luc et al., 2019). Additionally, insulin resistance is already prevalent in individuals with prediabetes (Luc et al., 2019). Untreated diabetes can result in blindness, renal failure, potential need for amputation, and increase risk of adverse cardiovascular events, which creates an increased need to target pre-diabetes through medication and lifestyle changes (Yuen et al., 2010) Diabetes management through nutrition (consuming more whole grains, fruits, and vegetables) has an influence on lowering blood pressure, glucose, and lipid levels can lead to reductions in secondary complications (Ley et al., 2014).

Diabetes prevalence within Low - and Middle-Income Countries (LMICs) has an impact on individuals and communities. Several LMICs have poor protocol and access to care to help diabetics in their countries which has resulted in the increase of diabetes and can be attributed to

factors such as ageing populations, urbanization, cultural and social changes, dietary changes, physical inactivity, and obesity (Shen et al., 2016). One in five people are usually unaware of their diabetes diagnosis and two-thirds of them are under a type of treatment (Shen et al., 2016). Individuals may be hesitant to get screenings for diabetes due to their lack of awareness of the chronic nature, causes, consequences, and management.

Furthermore, common diseases in LMICs are tuberculosis, HIV, influenza, and malaria. When an individual receives a diabetes diagnosis, their susceptibility to infection increases, and diabetes can triple the risk of infection from other diseases. There is a need for health systems and policy makers to make more of an effort to improve diabetes prevention, detection, and control in LMIC to mitigate long term consequences (Shen et al., 2016).

Diabetes in India

India has one of the highest prevalence of diabetes in the world. According to the International Diabetes Federation, in 2021, 74 million Indians have received a diabetes diagnosis with projections of 124 million to be diagnosed by 2024. In a study that looked at diabetes worldwide in regions such as South Africa, Latin America and South Asia, South Asia had the highest prevalence of pre-diabetes and diabetes and were more likely to have dysglycemia at a younger age, lower BMI, and waist circumference (Shen et al., 2016). Indians have a unique phenotype where they develop pre-diabetes and diabetes at younger ages and at lower body weights (Weber et al., 2021). The earlier onset of pre-diabetes and diabetes in Indians is hypothesized to stem from factors such as increased abdominal fat, dyslipidemia, and higher insulin resistance (Weber et al., 2021).

It is also important to consider the socioeconomic burden of diabetes in Indians. In 2010, the government-sponsored health insurance in India covered only about 19 percent of the population, and when private insurance is considered the percentage increased to approximately 25 percent (Yesudian et al., 2014). Lower income individuals in India had the highest burden of diabetes and spent a larger proportion of their income on diabetes care. When individuals are uneducated about the risk factors and behaviors that lead to diabetes this increases the risk of this disease within lower income families.

Specifically in India, the common diet includes the use of animal fat and ghee is used in most of Indian cooking can be attributed to the high prevalence of diabetes. This has a high level of trans fats and can be connected to insulin resistance and chronic inflammation (Hu, 2011). In addition to trans fats, refined wheat and polished rice is a contributor to the increase in diabetes in Asian countries such as India. During the last four to five decades, India had a rise of the use of highly milled white rice, which is a large staple in Indian cuisine. The replacement of undermilled rice with highly milled white rice increased the prevalence of diabetes in urban areas from 2% in the 1970s to 25% in 2015 and in rural areas from 1% to 14–16% (Bhavadharini et al., 2020).

A large percentage of India's population are smokers. The American Diabetes Association recommends people who are at risk for pre-diabetes and diabetes to prioritize smoking cessation because of its association with cardiovascular disease, diabetes, and other conditions. A previous Quit Tobacco International (QTI) study in Kerala found that 59% of diabetes patients were tobacco users (43.5% exclusive smokers) prior to diagnosis (Mini et al., 2014). Once made aware of their diagnosis, doctors can inform patients of the risks of smoking and its causes. Patients are likely to stop smoking once they are made aware of the risks associated with it and in India,

doctors are recommended to use culturally sensitive language to promote health habits like the cessation of smoking.

The adoption and maintenance of physical activity are critical foci for blood glucose management and overall health in individuals with diabetes and prediabetes. Exercise improves blood glucose control in type 2 diabetes, reduces cardiovascular risk factors, contributes to weight loss, improves well-being, and may prevent or delay type 2 diabetes development (Colberg et al., 2016). Much of the research on the effects of physical activity's effects on cardiovascular and cardiometabolic disease has been done in the West, but similar studies have shown that increased physical activity for Indians bear comparable results. In a large questionnaire study with participants from four different regions in India, researchers were able to deduce that more than half of the country's population in inactive, physical inactivity was significantly more common in urban areas of the country compared to rural areas, and males were more active than females (Anjana et al., 2014).

Evidence Based Lifestyle Interventions

There have been many different lifestyle interventions evaluated for treatment of diabetes in individuals across the world in attempts to combat the diabetes pandemic that affects such a large portion of the global population. Multiple countries have implemented diabetes prevention programs to promote healthier lifestyles. There have been major randomized clinical trials done in countries such as the Unites States, Japan, Finland, India, and China to document diabetes risk reductions (Galaviz et al., 2015). Studies within the Finnish Diabetes Prevention Study, The Da Qing diabetes prevention study, and the US Diabetes Prevention Program (DPP) all found a significant reduction in diabetes in long term trials ranging from 3-14 years (Ramachandran et al., 2006).

In 2010, U.S. Congress authorized the Centers for Diseases control and Prevention to lead the U.S. Diabetes Prevention Program. This program has targeted weight loss as the main driver to prevent diabetes and has made it a goal to find low-cost ways for diabetes prevention in partnership with community-based organizations, health insurers, employers, healthcare systems, researchers, and government agencies. A significant efficacy trial in the National Diabetes Prevention Program revealed that individuals who exhibited remarkable dedication achieved remarkable results. Those with impaired glucose tolerance, who managed to shed up to 7% of their body weight and engage in 150 minutes of moderate physical activity per week, succeeded in reducing their annual risk of developing type two diabetes by 16% (Albright & Gregg, 2013). The National DPP was developed from the findings on the Diabetes Prevention Program Lifestyle change program which was found to be effective in for all participating racial and ethnic groups with both men and women with a 58% reduction of chances of developing type 2 diabetes (NIDDK).

Since obesity is a risk factor for diabetes, researchers and practitioners alike have worked on lifestyle interventions such as physical and dietary changes. Additional factors to be considered encompass smoking habits and alcohol consumption. When diabetes interventions shift their focus toward increasing physical activity to approximately 4 hours a week, a consistent three-year commitment to such activity has demonstrated a 58% reduction in the risk of developing diabetes. This intervention was significantly better than medicine intervention like metformin (Tuomilehto et al., 2001). In addition to physical activity, changing nutrition and diet is a key component to reducing risk in diabetes, incorporating more whole grains, fiber, fruits, and vegetables into patient's diets can help with body weight loss. Changing dietary habits can be difficult, so some patients are led to use a dietician to help build healthier habits and get the

ball rolling. It is noteworthy that dietitian-delivered interventions were more effective for weight loss compared to other intervention delivery agents (Sun et al., 2017). An important limitation to note is that dieticians in different countries may have several types of training compares to U.S. trained dieticians which may lead to a greater success rate in U.S. based trainings and programs (Sun et al., 2017). Smoking and alcohol use are large contributors to the risk of diabetes as well. Individuals who smoke have a forty five percent increased risk of diabetes compared to non-smokers. Alcohol use showed a U-shaped relationship, with a 30–40% reduced risk of the disease among those consuming 1–2 drinks/day compared with heavy drinkers or those who do not drink at all (Hu, 2011).

Interventions Specific to Indians and South Asians

It is important to also consider social factors that could affect lifestyle interventions for Indians. Much of their culture is centered around food and social gatherings such as weddings. Since Indian food mainly consists polished white rice and clarified butters, it is important to explore simple and low-cost methods for diabetes prevention such as using non-invasive diabetes risk scores, to identify high-risk individuals who may benefit from lifestyle interventions from participants in India (Sathish et al., 2017). Two third of India's population lives in rural parts of the country with minimal access to healthcare providers and peer support has been shown to be an effective way to address distinct types of interventions for Type 2 diabetes prevention that have been delivered in community groups (Sathish et al., 2017).

A study focusing on diabetes interventions in India was the Diabetes Community Lifestyle Improvement Program (D-CLIP). Before this study, the South Asian Health, and Prevention Education (SHAPE) study based in the United States in Atlanta, Georgia performed focus groups and intervention classes on South Asians to tailor an appropriate intervention

(Weber et al., 2021). Data collected from this study reflected cultural food preferences and include tools to leverage social support, create a stronger foundation in exercise and overcome culturally specific barriers. The SHAPE study included 17 South Asian adults with pre-diabetes and BMI >22 kg/m2. The results from this study provided valuable information on the barriers faced by American South Asians in participating in 'standard' lifestyle change programs. This data was crucial to understanding indicate the feasibility and positive impact of culturally tailored programs for South Asian population (Weber et al., 2021).

The D-CLIP study was a 6-month randomized controlled trial implemented in Chennai, India that was a culturally tailored lifestyle education curriculum based on the U.S. Diabetes Prevention Program (DPP). Its participants included 578 overweight or obese Asian Indian adults with isolated impaired glucose tolerance (iIGT). Eligible individuals were identified through community-based recruitment and randomized to standard lifestyle advice (control) or tailored intervention including an addition of metformin. In the 3 years of follow up, there was a 32% risk reduction for participants to develop diabetes (Weber et al., 2016).

There is a success of randomized controlled trials for diabetes such as one study done in Kerala, India. The Kerala Diabetes Prevention Programme studied approximately 1000 individuals who were 30–60 years old with an Indian Diabetes Risk Score ≥60 to identify basic characteristics to identify high risk individuals. Participants also had to be without Type 2 diabetes on oral glucose tolerance test. The study was split into two groups, the control group, and the intervention group and its main goal was to find a way to identify diabetes in a low-middle income setting by using diabetes risk score instead of the oral glucose tolerance test which has been proven to be a more expensive test (Sathish et al., 2017).

In a sister study from the Kerala Diabetes Prevention Programme, there was work to adapt diabetes intervention studies from high income countries such as the United States, Finland, and Austria to be adapted to be more culturally aware for a peer-led intervention in Kerala, India. The adaptation process progressed through five phases: 1) assessment; 2) formulation of program objectives; 3) program adaptation and development; 4) piloting of the program and its delivery; and 5) program refinement and active implementation. This is just the start of diabetes intervention in India, but this leg of the K-DPP study is an important development for first well evaluated community-based, peer-led diabetes prevention program in India (Mathews et al., 2018). The 12-month intervention program consisted of a group-based peer-support program consisting of 15 sessions for high-risk individuals, including diabetes education resource materials and strategies for community engagement (Aziz et al., 2018). Over one thousand participants were enrolled in this study, and it was found that the program was very feasible and acceptable in changing lifestyle behaviors in high-risk individuals (Aziz et al., 2018). Additional results of this study showed significant reduction of diabetes incidence of participants with impaired glucose tolerance with a 32% reduction in 10-year cardiovascular disease in the intervention group versus the control group (Haregu et al., 2023). Additionally, this community-based peer-support lifestyle intervention was very cost-effective in individuals at high risk of developing diabetes (Haregu et al., 2023).

Current Literature on Worksite Interventions

Conducting studies at worksites has shown to be successful because it provides opportunities for group intervention and increase in social support (Aldana et al., 2006). There are many studies with varying amount of intervention time that have been proven to be successful.

A study on weight loss initiatives conducted at four different worksites in Boston-based office companies showed to be successful. Two sites were the control and the other two had the intervention assuming that there was no weight loss program done in the last 6 months, there was public transportation to reach the worksite, and there was capacity for there to be online meetings. Individuals that met the inclusion criteria (≥21 y of age, BMI (in kg/m2) ≥25.0, and a letter from the primary care physician with approval for weight loss) were enrolled in the study. The intervention was a free group-based weight-loss program for overweight and obese employees and a low-intensity health and nutrition education program. Additionally, a 6-month structured maintenance program was offered to employees who completed the weight-loss program. The results of this study showed that worksite interventions can be effective for achieving clinically important reductions in body weight and improved cardiometabolic risk factors (Salinardi et al., 2013).

A similar worksite diabetes study was conducted in 2003 with thirty-seven participants who worked at a medical center with prediabetes or undiagnosed diabetes where they participated in a 12-month prevention program (Aldana et al., 2006)). The results showed that weight, body mass index, waist circumference, oral glucose tolerance testing, fasting insulin, blood lipids, and aerobic fitness had improved significantly after the 6 months. An interesting component of this study was the inclusion of occupational nurses (Aldana et al., 2006). These nurses were able to translate the Diabetes Prevention Program to the workplace as a formal prevention program and played a key role to educate associates regarding risk factors for diabetes, establish wellness incentive programs, promote flexible work policies allowing more work-life balance and influence healthy choices in on-site cafeterias. In a one year follow up to

this study, researchers were able to find that participants were able to continue to decrease their blood glucose through education from the intervention (Aldana et al., 2006).

A more recent systemic review that looked at worksite interventions with a more insight into potential gaps in the research. The methods were consistent including multicomponent wellness programs, healthy diet interventions, physical activity interventions, and mental health/sleep interventions there. These studies showed positive effects between healthy lifestyle intervention and worker health. Each group had was significant in study length, intervention components, and worker populations, hut it found that future research should include longer follow-up periods, more objective measures of wellbeing, and evaluation of worker performance to identify the most effective interventions to improve worker health and wellness (Sidossis et al., 2021).

Cultural factors can be labeled as a barrier that may impact health which makes it important for both the healthcare provider and their clients to communicate with each other about their cultural world and how it affects their ability to complete an intervention or behaviors (Williams et al., 2001). In a study conducted with day care workers, many of them reported that their interest in the study was because of the low cost and convenience. Researchers also found that most of their participants came from the same ethnic background, so it was important for the study of culturally sensitive language (Williams et al., 2001). A commitment to be culturally sensitive is an asset for building such trust. This is necessary to reach individuals most likely to develop a preventable disease. Knowledge of personal risk empowers members of separate groups to improve their health status and change unhealthy behaviors that place them at risk (Williams et al., 2001). This day care study was also beneficial for understanding the importance of community education in seeking early treatment for symptoms of stroke and heart attack,

importance of dietary changes in high risk individuals, and the recalculation of stroke and heart attack mortality rates to reflect higher mortality rates than previously believed in the population studied (Williams et al., 2001).

INDIA-WORKS

The Integrating Diabetes Prevention in Workplaces (INDIA-WORKS) study considers the large prevalence of diabetes in India and takes advantage of the large workforce population that exists. The INDIA-WORKS intervention was based on the program tested in the Diabetes Community Lifestyle Improvement Program (D-CLIP) trial, a translational research study testing the application of the U.S. Diabetes Prevention Program (with the addition of metformin as needed). It was conducted at eleven different worksites across south, central, and east India across ten companies ranging from 1,500 – 50, 000 employees.

Participants for this study included Indian employees 18 years or older. They were classified as overweight or obese based on the World Health organization defined South-Asian cut-points: BMI ≥ 23 kg/m2 and/or waist circumference ≥ 90 cm for men and ≥ 80 cm for women (35) and have prediabetes (HbA1c of 5.7–6.4%) or diabetes (HbA1c ≥ 6.5%). Additionally, participants were not currently taking any medication to treat diabetes, not pregnant or breastfeeding, and did not have a history of heart disease or current serious illness. Lastly participants should not have had any conditions impeding participation in physical activity and diet change program.

The intervention program helped employees in the program on an individual level though a structured lifestyle change program and on an environmental level through supportive changes to the worksite environment.

INDIA-WORKS aimed to overcome barriers to worksite delivery of lifestyle interventions by using the peer educator model while promoting worksite-based environmental changes to support program participants. Additionally, the intervention aimed to be acceptable, accessible, cost-effective, culturally appropriate, and easy to disseminate and maintain for participants. Other aims included measuring the effectiveness of the program adoption among participants by looking at the decrease of two or more cardiometabolic risk factors, such as blood pressure or HbA1c.

The INDIA-WORKS intervention used worksites health facilities to delivering lifestyle programs and for testing and training and utilizing trained worksite staff as peer health educators. This was a hypothesized to be an effective approach for delivering lifestyle education and overcoming barriers such individual-level participation and costs. In addition, the program might overcome barriers for diabetes care through diet and exercise through social support and convenience.

Research question: There is a need to describe the reported uptake of the INDIA-WORKS intervention by program users by exploring the program's impact on diet and how gender, cultural attitudes, mental health, and social gatherings might have affected diet changes. By evaluating the program, this intervention can be use in more populations around India and to other populations that may have a prevalence of diabetes and fill in knowledge gaps about the sample population. Therefore, the purpose of this paper is to describe the perceptions of the diet intervention among program users (participants, worksite managers, peer educations, program staff, and study drop-outs).

Chapter II: Methodology

Participants

Participant types the qualitative components of INDIA-WORKS included worksite managers, peer educators, program 'completers,' program 'dropouts,' and implementation team members. Eligible intervention participants (completers and dropouts) for this study went through two phases of recruitment through a questionnaire including questions about their height, weight, and family history. The second phase included a blood draw to assess HbA1c, glucose and other measurements. Eligible participants were older than eighteen, overweight/obese, living with pre-diabetes/diabetes, not pregnant or breastfeeding, and did not have any conditions that affected their participation. Intervention participants were given two goals of increasing their physical activity to 150 minutes a week and to lose 7% of their body weight during the intervention program. They participated in weekly lessons and monthly maintenance classes to support their physical activity and diet changes. Worksite managers, peer educators and team members were individuals from the worksites or research institution study teams.

Recruitment for interviews and focus group discussions was done through gatekeeping and enrollment list of lifestyle classes. These strategies were implemented by discussing the purpose and data collection with the managers and asking for permission and support for the data collection. Potential interview/focus group discussion participants were contacted through email, phone, or in person. The diversity of participants came from different regions, different genders, type of workplace, and types of employees.

In Depth Interviews and Focus Group Discussions

During the first year of the study while participants immersed themselves within this worksite intervention, qualitative data was collected study (December 2018-June 2019). Members of the INDIA-WORKS team performed individual in-depth interviews and focus group discussions to assess program adaptation, implementation, and acceptability.

Interviews and focus group discussions were conducted privately by a trained INDIA-WORKS team member in the participant's preferred language (English, Hindi, Malayalam, or Tamil). Participants participated in one interview or FGD and it was assured there was no conflict of interest between staff and managers. The goals of the study were shared with participants and informed consent was performed before all interviews. Focus group discussions (FGD) were conducted with participants who completed the program to understand community-level experiences of the program. In-depth Interviews (IDIs) were conducted with participants who completed the program and dropped out and managers/supervisors to understand the perceptions of the program, what worked and what did not, and suggestions for improvements.

Data Analyses

Translated, verbatim transcripts of the in-depth interviews and FGDs were managed using MAXQDA 2020 (VERBI Software). Codes were developed to organize and categorize the data that represent meaningful concepts and ideas from the FGD and IDIs. Thematic analysis techniques were used to create a codebook including both deductive and inductive codes for each set of qualitative data (e.g., interviews with peer educators, FGDs with program participants). Analysis of these codes was done by creating thick descriptions of codes to allow for a deeper

understanding of the data, give more context to the codes, and increase richness and detail of participants experiences, behaviors, and interactions. to the research findings. The analysis included here includes the following codes:

- **Perceptions on Diet Changes**: Use for discussion of effects of the program on participants' dietary behaviors. These changes may be at home, work, and other community settings.
- **Gender**: Use for discussion for effect of gender on participants in this diabetes prevention program.
- **Cultural Attitudes**: Use for discussion of cultural attitudes of participants and its effects on their participation in the diabetes prevention program.
- **Social Gatherings:** Use for discussion of participants lifestyle behaviors (mainly diet) during social gatherings such as weddings, work events, or other functions.
- **Mental Health:** Use for discussion of participants mental health throughout the diabetes prevention program.

This analysis is used to capture the complexity, cultural nuances, and meanings embedded in the data codes from the IDIs and FGD from the individuals who participated in the INDIA-WORKS program.

Reflexivity techniques were used in all processes of the methodology of this paper by understanding positionality and self-reflection throughout the process. It is important to acknowledge positionality and biases that may have influenced interviews, observations, and interpretations to enhance credibility of data analysis, reduce bias, and mitigate assumptions.

Chapter IV: Results

Worksite managers, peer educators, INDIA-WORKS staff members, and implementation team members reported uptake of the INDIA-WORKS intervention by program users by exploring the program's impact on diet and how gender, cultural attitudes, mental health, and social gatherings might have affected diet changes. Intervention participants, both those who completed the program and program dropouts, reported on their personal uptake of the program. Participants discussed factors that made behavior change successful in addition to different barriers that may have negatively impacted their success in the program. Codes reported on were Social Gatherings, Cultural Attitudes, Mental Health, and Gender in the context of perception of the effectiveness of the INDIA-WORKS diet change program.

Mental Health

A main talking point of managers, peer educators, and participants was how stress impacted their mental health throughout the program. There was stress from family, poor work conditions, and low salaries. Participants did not always feel like they had good social support from their family and colleagues. The technique program intervention participants used to elevate stress was the implementation of yoga, meditation, or exercise into their routines to help with their mental health. Additionally, participants found that the classes were very helpful with having a community and talking about their experiences at the classes.

Family stress is a factor that largely impacts the mental health of many of the participants noted by peer educators. Many participants have obligations at home such as taking care of their children and families which adds to their mental capacity. When making changes through the program peer educators state: "There is family burden, workload, worrying about children, there

are so many reasons for stress. So, the way in which we respond, that is how we get stressed, and it is very important for us to release this stress" (Peer Educator). A couple of participants that completed the program stated feeling sad or lonely due to losses in their families from the death of a husband or son which effects their mental health. This does not necessarily affect their success in the program but is an underlying emotion.

Peer educators notes that employees experience stress from their work conditions because of their hazardous occupation and increased workload to meet targets, some companies are expecting their workers to reach higher targets but are keeping their salaries the same or do not hire new people. Dropouts mention that they end up working more hours which causes them to become stressed and made program participation a challenge.

> But money has not increased, and the burden of work has. People are working as if there is no option. They do not want to from the heart, but the management has forced and made it compulsory. So, they are working forcefully. Stress will definitely increase. Because look, earlier they were getting rest for 4 hours, now, they are not getting rest for even an hour or so. (Peer educator)

Additionally, managers, peer educators, and participants state that some of the stress comes from inconsistencies in salaries. Companies have not given them their full salary, or they are not receiving salaries on time which causes stress because participants have financial commitments. A grievance is: "If we do work and still do not get paid enough to have a good life, what is the point is working? I do not want to prosper; I need to survive" (program completer). Additionally, some participants who complete the study say they receive a low salary which adds stress because they struggle to make it hard to make ends meet. They need to be able to afford to pay for their children's school, eating healthier foods, or even paying for the bus fare

to get to work; “I have to educate my two kids, and my family should survive without knowing hunger. It is pointless to have a job but not enough salary to survive.” (Program completer)

Dropout participants note that the lack of support in their workspace or their home space effect their mental health. It makes it harder for them to be motivated to complete their intervention goals when their family and colleagues are commenting on their change in their diet or asking why they have changed their behaviors and these negative attitudes in the workplace make them sadder and they cannot trust the people around them. For example, “They [coworkers] talk in a weird slang and scolded me a lot. He [manager] then came back in the afternoon, to scold me more. Even though I did everything so perfectly, I have no one to support me in here, and when we are isolated, we get even sadder.” (Program Dropout).

The diabetes prevention classes that individuals took had a positive effect on mental health for the participants that attended the classes (both dropouts and completers) because it was a mode of relaxation for them. One program completer shared, "The classes are really good. I feel happy and my mid is relaxed. Even when I am stressed, while attending the classes, it does not bother me.” This gave them a community that allows them to talk to people from the same and different backgrounds and they feel less stressed after taking the classes. They feel as if they are working on themselves in a positive way.

Participants “felt that my stress levels came down. When we are focusing on the exercises, the tension levels are coming down” because “[they] have to deal with stress back home, and at work as well. So when exercising, we are not concentrating on that, and I am able to relax because of it” (Program dropout). Performing meditation, yoga, or exercise reduced their stress and helped with mental health outcomes.

Social Gatherings

Interviews from participants, staff, and peer educators showed that intervention participants had changes in their diet during social gatherings while participating in INDIA-WORKS. They would choose to avoid unhealthy foods or limit their intake of them. Additionally, they would keep their own food with them to eat such as nuts and dried foods if they were at a function so they would not have to eat oily foods at parties. Participants sometimes would allow themselves to indulge in the unhealthier foods at functions if they knew it is a rare occasion. Participants also noted that they were judged by their colleagues and friends when they would eat less at social gatherings.

Managers and participants expressed the need to have self-control when eating foods deemed as "unhealthy," such as sweets, fried items, and rice, when going to social gatherings such as marriages, birthdays, and work events. When attending parties participants mentioned "earlier we used to eat everything [at weddings], all the items that are there," but now they "look for where is the salad. Now we take 1-2 rotis, a little vegetables and salad" (Focus Group Discussion Completers). At other times, participants opted to avoid unhealthy foods entirely, bringing their own snacks from home, such as nuts and dates and while at drinking parties, they typically limit themselves to one to two drinks instead of five.

Conversely, there are participants who approached their dietary changes differently because they felt that it was hard to eat healthy at social gatherings. Some drop out group participants "those days [functions] will be exceptions" because "if we go out for a function, we cannot tell them that we have a certain food habit" (Peer educator) and they will stray from their normal eating regimen during the INDIA-WORKS program. They may eat more unhealthy food

during these times, but “we are able to control when we are doing it ourselves back home” (Peer educator) and follow their diet handbook.

Participants sometimes felt anxiety when they attend parties because some of their colleagues or friends bully them for not eating anything since they have diabetes. They tell them, “Do not come, do not join, so you got diabetes, you should not suppose to eat this. We will have all fried items” (Program Staff). Participants are asked by their peers why they attend the event, or “say why are they invited; they do not eat anything.” (Focus group discussion completers).

Cultural Attitudes

Cultural Attitudes affect the success of the diabetes prevention program and each person’s success. Peer educators and participants face different barriers in the program such as how they prioritize their health. Holidays affect how participants can attend class and what foods may be available to them. Similarly, participants that represent the different regions and religions in India eat different categories of food. Myths and stories affect participants’ behaviors when exercising or limiting food consumption.

Participants describe that they follow specific regional diets based on where they reside; “North Indian, you eat channa masala. Like, eat paani poori. Like that if you say, it is a very rare group you can say foods” (Peer educator) and south Indians, such as participants from Tamil Nadu, foods “regularly eat is rice, dal, wheat” (Peer educator). Many Indians adapted their regional diet as part of the INDIA-WORKS program instead of changing to another diet pattern. Because rice, drinking tea, and oil usage is such a large part of the culture and food in India, reducing the intake of rice or drinking tea can be difficult for people. It was advised by peer

educators that should make changes in small steps. These variances also exist vary among Hindu participants versus Muslim participants because Muslims are more likely to eat red meat in their diets. Since Muslim participants are more likely to be non-vegetarians, peer educators say they must be more mindful and reduce the amount of red meat they eat.

A manager speaks that being healthy and prioritizing their health is not a primary concern for Indians and "the culture is not as it was before. Everyone gets ill nowadays, while the older generations rarely got ill" (Peer Educator). They are more concerned about their family, children, work, or their own entertainment. Because participants prioritize these things, they are less likely to find time to search for healthier foods and be available for exercise. This is a challenge because "there are no spaces available to exercise and there is no land for agriculture. Everybody is in front of the TV, eating, on the computers, sleeping, eating food, goes to the office and that's it" (Peer Educator).

When those participating in the study eat at home they are encouraged to eat more food by family members. They may know should eat less to be healthier, but their mothers will fill their plates completely and they will be obliged to eat a full plate of food. Additionally, there is a cultural notion within all participants and peers that " it is not good to be slim" (program dropout) because this means you are sick or that they are not eating properly.

One program completer shared, "In India, everyone believes in miracles. So, we have to do miracles, the people who get benefitted." If something is connected to astrology or there is some sort of bad story associated with a behavior, this is a motivating factor to do or not do a behavior. For example, some participants would start walking around their workplace, but their superiors stated that it was bad luck or bad things have started happening, so they stopped walking. A positive effect of cultural attitudes is mentioned by focus group discussion completers

is “if we are able to give them faith that if they come here [worksite classes], their sugar will be controlled, they will definitely come here.” (Focus group discussion completers).

Participants are less likely to attend their classes when there are holidays such as Deepavali or Ramadan according to the peer educators. They prioritize going to their hometowns to spend time with family during their holidays. When prayers, fasting, or religious rituals are observed participants will not go to class. “When I was following that cultural ritual, that time only for five weeks I couldn’t come, [but] after that I have come for all weeks without fail” (Focus group discussion completer).

Gender

Women perceive having more difficulty actively participating in the INDIA-WORKS program compared to their male counterparts. They have responsibilities at home such as childcare and household chores that affect their ability to attend classes and exercise at home. Additionally, gender perceptions may make women shyer and unwilling to participate in classes. INDIA-WORKS completers and dropouts expressed their families effecting their involvement in the program. For example, they would need permission before attending the classes from their families to make sure it does not interfere with other responsibilities, or they are mocked by their families for doing the exercises they learn from classes. Women also mention that their periods to be a barrier to their success in the program because it can affect how often they exercise or what they eat.

The diabetes prevention classes are split in different ways and have varied demographics. Some sections have more men while others have more women. It was noted by a staff member that women are more engaged in the diet portion of the classes compared to men who are more

interested in the physical activity portions. A peer educator observed that women have more fear when they hear about diabetes because they see it as a big deal due to the severity of disease and take it more seriously in the program. The same peer educator mentioned that women are more likely to call in when they cannot attend a class whereas men are described as "lazy" when participating in the program. Women are also more likely to attend the classes because they look for the work wellness benefits.

> That is a character of ladies. For them when they hear about diabetes, they think it is something big. As generally many men has diabetes , for them they did not think that much. Ladies are not like that. Ladies, have less diabetes. Then they take it as a big deal. They have a mind to change it anyhow. Even when we are a bit late they call us. We are here, asks whether you are not coming. But gents usually will not call. That is the difference (Peer Educator).

Women who participate in the program say they have more specific time constraints that make it difficult to always attend the classes on time because different commitments outside of work compared to male counterparts; "I have to do housework as there is no one else to do it. I have to drop my son off at school after that" (Program dropout), but interestingly they do not see their housework as an additional task but as a normal and necessary part of their life and routine. Women will wake up early around 6am, make sure their children are fed and ready for school, dropped off at school, and housework/chores are done before they go to work. As one woman shared, "If I do not wash them [dishes], he does not eat food. So, I do not leave without washing them. I have not felt that it was a huge task ever," (Program dropout) as it takes only her around 2 hours to do this chore.

One recommendation by a participant who completed the program was to adjust the timing of the classes to be later so more people, especially women, would be able to attend the classes. Additionally, it is difficult for mothers to find time to go to classes or do their exercises at home because there is housework that is their priority. For example, peer educators noted that women are more likely take a bus or public transportation to get places whereas men may take a two- or four-wheel vehicle which can affect their ability to attend classes. Program drop-outs also noted that single mothers have their own barriers in addition to the one's states above; they have a larger responsibility in their homes, which can make them miss classes, work, or the INDIA-WORKS classes.

A couple of INDIA-WORKS dropouts stated, "that they end up eating leftover food as they don't want it to go to waste" (Program dropout) which results in them gaining weight. Women do this to prevent wasting food but share that they "have asked my husband to not bring fried foods and get fruits instead. That has helped my weight" (Program dropout). Food that is consumed can include both healthier foods women make at home and take-out food that may be unhealthier because it is fried. One peer mentor mentioned that the program could be improved by focusing more on the gynecological health of the women as well since there is many participants who are women and/or mothers.

INDIA-WORKS dropouts and completers stated that much of the INDIA-WORKS education they received was implemented by their wives or daughters. One participant shared, "my wife and my daughter they [laughter] [inaudible] trying to be the change. But I will not. little bit I changed" (program completer). Women in their families are more in control and in charge of the food bought for cooking and how much oil and rice is consumed compared to men because of the division of labor in their households. One program completer described

housework being only the work of women of their family. Another INDIA-WORKS completer explained that his wife does not allow him to do housework because she is the homemaker. This is not the case for all families as another INDIA-WORKS completer noted that both the husband and wife cook and buy groceries for their household.

Women who did intervention activities at home felt their family respected them less due to their gender. For example, women were less likely to be listened to when sharing information that they learned about in the class to their family members. They were mocked by their family members when they would do exercises at home.

> P3: Because we are women, they do not listen to us, how much ever we may try. We do follow what is being told to us in the class. But the ones back at home, don't get to be in the class and has to rely on our second hand information. They find it difficult to accept what we have to say as they are not too sure whether or not we are saying the truth.
>
> I: Do you believe that this issue is present because we are women?
>
> P4: Initially, when I would do exercise in the house, they would make fun of me by saying "There she goes" (laughs).
>
> P4: It is true. My son and my husband makes fun of me
>
> P6: They want to know how long this would last." (Focus Group Discussion Completer)

An INDIA-WORKS completer noted that it may be better for women and men to be separated for the classes to support their emotional and physical comfort in the classes, "because there will be people who are shy. All we cannot do it [exercises] freely"(Focus group discussion completer). Women are more aware of what they are wearing and how they do exercises that

require raising their legs or arms. It is harder for women when they are wearing a saree versus a salwar to do exercises. Additionally, INDIA-WORKS completers mentioned that there is a feeling that makes people think "will they laugh." This affects full involvement in the classes and may make them stop attending. A recommendation is separated classes "for ladies one room, gents one room" because this will create more involvement due to gender separated classes to do exercises and be fully involved in the program and feel less self-conscious. During classes "they [women] only will move away and go. and they will keep chairs in between and give more space" (Focus Group Discussion Completers)

INDIA-WORKS female dropouts expressed that their menstrual cycle as a barrier to the program. Women cannot exercise as much as they want when they are on their periods. Days they are menstruating can be harder because they are more lethargic, dizzy, or nauseous. Additionally, women who are menstruating are shyer in classes and may be less likely to participate in physical exercises. In addition, participants often make less healthy lifestyle choices when menstruating.

> As long as I am healthy and disease free, I don't feel housework is a difficult task. Once I go back home from work, I will still have more work left. I will have to prepare tea and dinner and such. I do not feel lazy, and I do everything just fine. What I feel is that, unlike the older days, we have all the facilities that we need. So, I have never felt a need to be lazy. But when I am sick or have my periods, I find it a little difficult and we buy dinner from outside instead. (Program dropout)

A gender barrier noticed by staff was that women must "find out from my spouse whether am allowed to go or not [to the classes]" (Program Staff). For example, there was an instance of a woman who was initially allowed to attend to the classes, but later was not allowed to attend

because her spouse did not let her due to time conflicts. Her responsibilities at home were deemed to be more important. If the class interfered with some other responsibilities such as housework or picking children up from school, they were then not allowed to attend the program classes.

Chapter V: Discussion

This paper evaluated the reported uptake of the INDIA-WORKS intervention by program users by exploring the program's impact on diet and how gender, cultural attitudes, mental health, and social gatherings might have affected diet changes for both diabetic and pre-diabetic individuals. In the evaluation of this program, we described the perceptions of the diet intervention among program users (participants, worksite managers, peer educations, program staff, and study drop-outs) and discuss if the intervention disseminated to other populations around India and other populations that may have a high prevalence of diabetes and fill in knowledge gaps about the sample population.

Mental Health and Cultural Attitudes

Key findings from the INDIA-WORKS program revealed that stress significantly affected the mental well-being of managers, peer educators, and participants throughout the study. Sources of stress included familial responsibilities and inadequate salaries. Additionally, the lack of social support from participants' communities posed challenges to their motivation in achieving their INDIA-WORKS goals, particularly when questioned by family and colleagues about behavioral changes. Cultural attitudes further compounded this issue, as participants often had commitments to religious holidays, like Ramadan or Diwali, affecting their attendance at diabetes prevention classes. This dual commitment highlights a barrier as participants strive to engage in both their cultural festivities and diabetes management activities, seeking support from both communities.

Social connectedness and spirituality are important factors influencing illness management and self-care (Lynch et al., 2012). A diagnosis of chronic illness tends to be

associated with increased feelings of both isolation and loneliness which can affect someone's failure to manage their illness (Lynch et al., 2012). INDIA-WORKS participants noted that the lack of social support from their families and colleagues made the program more difficult to complete. The need for social support has been identified in other studies as well and is a contributory factor to non-adherence to a diabetes dietary regimen in adults with diabetes (Uchenna et al., 2010). The American Diabetes Association has made it clear the importance to include psychosocial issues must be addressed by all diabetes education programs it certifies to enhance the success for coping in adults in such programs (Davis et al., 2022).

Social support continues to be driving factor in South Asian communities. Group norms and social values are based on community endorsement, so it is important to consider social support networks for promoting health behavior change for South Asians (Lucas et al., 2013). In the United Kingdom, the most successful recruitment strategies into Prevention of Diabetes and Obesity in South Asians (PODOSA) study were the partnerships with the local South Asian organizations and individuals. Also, referrals by word of mouth from existing participants created a snowball effect for recruitment (Douglas et al., 2011).

Additionally, cultural attitudes affected the success of the INDIA-WORKS program for both peer educators and participants, because they represented the different regions and religions that span across India. As a result, many participants ate different regional cuisines. For examples, someone who is north Indian and Hindu may be more likely to eat channa masala and be vegetarian versus their Muslim or Christian counterpart that eats more mutton in their daily diets. Regardless of the variation in foods from different regions, Indians across the country are still consuming high caloric foods high in fat with low fruit and veggie intake. Variation in food

consumption varies more in individuals who live in urban areas compared to more rural areas, which may contribute to diabetes more (Sachdev & Misra, 2023).

Beliefs in myths and stories affected participants' behaviors when exercising or limiting food consumption during the program as well. It has been found that South Asian cultural and religious beliefs described diseases such as diabetes as fate or an external factor rather than internal responsibility (Lucas et al., 2013). In a study about normalizing diabetes in Delhi, participants with a pre-constructed notion of their illness had less stigma and stress due to diabetes when they were part of social communities (Mendenhall et al., 2016). The data from this study suggested that the pro-social construction of diabetes in India was both helpful and harmful for patients because it provided psychological comfort, but also lessens the motivation for prevention of their illness (Mendenhall et al., 2016).

Social Gatherings

Participants had changes in their diet during social gatherings by choosing to avoid/limit unhealthy foods that are heavy in oil or contained more rice. Sometimes participants would keep their own food with them to eat such as nuts and dried foods if they were at a social function. Conversely, participants sometimes would allow themselves to indulge in the unhealthier foods at functions if they knew it was a rare occasion. Traditional foods and how they are served (e.g., types of foods to serve to guests) have social significance and changing behaviors like reducing the consumption of such foods could risk offence or alienation from the community (Lucas et al., 2013). In INDIA-WORKS, some participants who reported changing their food intake at events, experienced pushback from others. Comparable results have been seen in other populations. For example, in a similar qualitative study that looked at cultural dimensions of diabetes management in Middle Eastern Immigrants living in America, participants with diabetes found

attending social gatherings stressful because there was a central focus on the consumption of traditional ethnic foods, many of which they needed to avoid as part of their diabetes program (McConatha et al., 2020). This body of work might reflect the difficulty that comes from social gatherings and having less control of how the food is made (i.e., amount of oil) and the stress that comes from being hyperaware of one's diet in these situations. In addition, a study done in Kuwait had similar findings where there were barriers to adhere to a specific diet because of the high number of social gatherings participants attended (Serour et al., 2007).

On the other hand, social gatherings are a crucial part of individuals' lives since they provide a sense of community. Finding effective tools to assist participants in lifestyle change programs with navigating these events in a way that can be supportive of their goals and provide positive mental health support is needed. One study found success in making educational pamphlets for managing diabetes for participants before Chinese New Year and individuals who received these pamphlets had better glycemic control and less increased in HbA1c values compared to those who didn't (Brandon Chen, 2022).

Gender

The global gender gap measures gender equality from country to country and the report places India at 135 out of 146 countries as of 2023 and is measured using three dimensions: reproductive health, empowerment and the labor market and these different dimensions are clearly seen in India and the INDIA-WORKS study (D. Jayarani & T. Sudha, 2023). Low status restricts women's opportunities and freedom, giving them less interaction with others and fewer opportunities for independent behavior, restricting the transmission of new knowledge and damaging their self-esteem and self-expression (WHO).This can be seen in the INDIA-WORKS program as it was harder for women who participated to fully engage in the program. Their

expectations outside of work were different than their male counterparts, and they had other responsibilities that made participating in the program harder.

For example, women were more likely to prioritize their housework over the INDIA-WORKS program and the lifestyle changes the program promoted. Women in families had more control of the food bought for cooking and how much oil and rice is consumed compared to men; however, they were reluctant to make these changes because their family were unsupportive. As seen in other studies, men do not have major responsibilities for cooking and they had an easier time making dietary changes because their spouses took the responsibility for cooking healthy meals appropriate for people with diabetes (Lucas et al., 2013; McConatha et al., 2020). Korean American women with type 2 diabetes had a similar experience, because women assume the nurturer role were always ready to make self-sacrifices by prioritizing their family's needs over their own due to patriarchal family structures (Song et al., 2012). Women with diabetes have a greater likelihood of compromising their dietary needs for the sake of their familial dietary preferences (Basu & Garg, 2017). An example of women prioritizing their families over their health in the INDIA-WORKS program was when women who were mothers often ate their children's leftovers to prevent wasting food which resulted in them gaining weight.

Menstruation is already a "taboo" topic for many women in India because it is seen as unclean (Vijay et al., 2022). Women who were menstruating during INDIA-WORKS felt more lethargic, dizzy, or nauseous which affected the food they ate and created barriers to their success in the program. Other people's lack of knowledge of menstruating women limits their support when they have symptoms due to their periods (Mason et al., 2017). Menstrual leave could potentially be an option for women but may also perpetuate the belief that menstruation is something to be ashamed about and to be kept private and therefore avoided in the workplace

(Bobel et al, 2020). The practice could also bring unwanted attention to women who already feel shy about the topic.

Women have their own health needs such as menstruating and menopause. In a study called Mediators of Atherosclerosis in South Asians Living in America (MASALA), South Asian women's post-menopausal status was significantly associated with hyperlipidemia, hypertension, higher BMI, and greater subcutaneous fat area (Vijay et al., 2022). This holds significance within INDIA-WORKS because diabetes is a recognized risk factor for cardiovascular disease. It also underscores one disparity in women's health experiences as compared to men.

Implications

Cultural attitudes, mental health, social gatherings, and gender all act as social determinants of health. Social determinants of health play a crucial role in shaping the prevalence, management, and outcomes of diabetes and how to create successful interventions like INDIA-WORKS (Hill-Briggs et al., 2021). These codes helped us understand the conditions in which people live and work and their perceptions of the program. They also indicated barriers and facilitators to lifestyle change that were addressed by the program. We were able to explore factors such as work conditions, social networks, home life, and physical environment. We then were able to look at where these played a role in the lives of both the peer educators, staff, and managers as well as the participants themselves (completers and dropouts). Understanding the impact of these determinants on diabetes interventions offers valuable insights into public health strategies and prevention efforts.

Worksite interventions can be changed to address the social determinants of health discussed in this paper. For example, separating INDIA-WORKS classes by sex could make it

easier for women to openly discuss and problem solve their specific barriers, such as home life or menstruation. Similarly, participants could be separated by similar cultural groups during the worksite intervention so discussion and social connection could be stronger on the types of behavior changes made compared to participant's peers.

Understanding the socioeconomic status of those who participated in the INDIA-WORKS program influences how this intervention is perceived and how easily the intervention can be incorporated in people's lives. Participants mentioned that missing pay or low salary created stress which in turn effected their ability to be successful in the program. Healthier foods and alternative oils may not be accessible to everybody in the program depending on where they live and what they budget for their weekly groceries. As a result, lower-income individuals can face a higher risk of developing diabetes or exacerbate their current condition due to factors such as unhealthy diet, limited access to nutritious foods, or reduced opportunities for physical activity.

A future direction that looks at the type of foods eaten by Indians, would be to look deeper into the socio-economic factors that influence diet from people living in urban and rural areas. Lack of culture-specific approach towards identification of modifiable risk factors, such as socio-economic background, level of literacy, cultural practices and providing culturally acceptable solutions is a major hurdle in the conduction of health behavior changing initiatives (Sachdev and Misra 2022).

The INDIA-WORKS program is a good start for a public health intervention that address social determinants of health because it meets participants where they are. It has targeted education and support programs that empower individuals to manage their diabetes effectively. In fact, less than 10% of people who are newly diagnosed with diabetes attend a diabetes self-

management program within the first year of the diagnosis because of lack of time, inconvenient location, lack of personal commitment to improving health, lack of awareness of available programs, but worksite interventions circumvent many of these known barriers to accessing programs (Brown et al., 2018). Participants from INDIA-WORKS mentioned that the classes they attended were a place for relaxation. Learning about their disease and having a social support network created space to discuss best practices and foster supportive communities. Strong social support networks can positively impact diabetes intervention because they provide emotional encouragement, practical assistance, and accountability for self-care behaviors (Brown et al., 2018).

INDIA-WORKS is also a good start to understanding the impact of health education and educational attainment for at risk individuals. Lack of education can impede diabetes prevention and management efforts by affecting individuals' ability to understand health information, adhere to treatment plans, and adopt healthy behaviors (Chawla et al., 2019). Public health initiatives should prioritize health literacy programs that provide accessible, culturally relevant information about diabetes prevention (Cavanaugh, 2011).

INDIA-WORKS could inform similar interventions among South Asia diasporas. The South Asian Health, and Prevention Education (SHAPE) study was done in Atlanta, Georgia to test the feasibility of a culturally tailored Diabetes Prevention Program. The results explored barriers faced by South Asians living in America in participating in ‘standard’ lifestyle change programs. It showed the positive impact of culturally tailored programs for diabetes prevention in the South Asian population (Weber et al., 2021). Another, US intervention was able to focus a translational diabetes prevention program intervention for Gujarati Indians and it was culturally adaptable because it was implemented in a Hindu Mundir which was helpful in refining data

collection and analysis for such a diverse ethnic population and was able to help participants reduce their HbA1c levels (Patel et al., 2017).

It is important to note that acculturation, the process by which individuals adapt to a new culture when migrating to a different country, plays a significant role in research in immigrant populations. Overlooking or inadequately accounting for acculturation can lead to biased results and erroneous conclusions when looking at a large group like South Asians. Asian Indians in the US have clearly leaned towards some level of Asian orientation and hence retain some cultural values regardless of disease status or the duration of years in the US (Venkatesh et al, 2012).

Future directions for a qualitative study on a diabetes intervention could focus on a long-term impact assessment by conducting follow-up interviews or focus group discussions with participants who have participated in the intervention Researchers will be able to understand the long-term impact on participants' diabetes management, lifestyle changes, and overall well-being. This could help assess the sustainability of the intervention's effects and identify any challenges or successes participants have experienced over time. Additionally, considering the cultural adaptation process and its impact on health behaviors and outcomes is crucial for ensuring the success and long-term impact of interventions. Delving deeper into the identified barriers to engagement with the intervention. Understanding the nuances of these barriers is essential for developing targeted strategies that effectively address the diverse needs of specific demographic groups, such as women or individuals from different cultural backgrounds. This can enhance their relevance, accessibility, and effectiveness.

Strengths and Weaknesses

Doing both in-depth interviews and focus group discussions with the study population allowed us to talk to different participants groups including managers, staff, peer educators, and those who completed and dropped out of the study. This allowed us to get a deeper understanding of the perceptions of the success and drawbacks of the program directly from those who were a part of it. Having these interviews and focus group discussions also allowed us to get a contextual understanding of why participants stated their beliefs and experiences and what social, cultural, and environmental factors may have influenced these behaviors and attitudes. In depth interviews allowed for diversity in the data because of the different experiences' participants had with the program and gives context to why participants gave specific answers. Focus groups yield the same benefits for the type of data collected, as well as participants being able to create constructive interaction and participants can build off each other's responses.

A strength of this qualitative data analysis is the large sample size, because we were able to collect a broad spectrum of perspectives and experiences from managers, peer educators, staff, and study participants. We uncovered patterns and themes with a richness and depth that may not have been found in a smaller sample. This provided greater confidence in the findings and conclusions drawn. Additionally, this allows for the exploration of variations within the data, highlighting the complexity and heterogeneity of the INDIA-WORKS study.

One notable limitation of this study was some missed opportunities to probe deeper into certain quotations, which could have enriched participants' perspectives. Some issues, particularly those mentioned organically during discussions, could have been explored more deeply.

Additionally, certain individuals might have been overlooked during the implementation phase. This could include employees with irregular work schedules or those or employees who are less engaged with workplace wellness initiatives might not have been effectively reached by the intervention. Identifying these potential missed participants could have added to essential inclusion for refining future worksite interventions.

The drawback is that the analysis is inherently subjective and may make this study hard to replicate. Our researchers' interpretations may be influenced by their own biases, perspectives, and experiences, which can affect the reliability and validity of the findings. The researcher's positionality influences the analysis and interpretation of findings. Specifically, my background as a Master's in public health student and a South Asian woman shapes my perspectives, biases, and assumptions of this analysis. In turn, this impacts the way I engage with the research topic and the data shared by participants. Different researchers may interpret the same data differently and what is seen as more important from the codes.

Conclusion

In conclusion, the integration of social determinants of health, such as the cultural attitudes, gender, mental health, and social gatherings, analyzed in this paper shows the importance of understanding the interplay between social and environmental factors that shape the experiences of participants in the INDIA-WORKS program. We were able to identify the strengths of the program and barriers to participating by exploring the lived experiences of individuals within their socio-cultural contexts. This paper offers unique insights into the underlying mechanisms through how these factors effect participant's success in the INDIA-WORKS program.

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