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Understanding Behavioral Changes After a Participatory Research Informed Activities to Promote Oral Health

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Abstract

Objectives: Inequalities in oral health have been on the rise globally. It is not the least in Sweden, where differences exists not between regions, but among subgroups living in vulnerable situations. This study aims at understanding behavioral change after participation in participatory oral health promotional activity among families living in socially disadvantaged neighborhoods in Southern Sweden.

Setting: The current study involved citizens from a socially disadvantaged neighborhood in Malmö city together with actors from academic, public and private sectors. Residents in these neighborhoods have low education levels, high rate of unemployment, crime and most importantly poor health.

Participants: Families with children aged 7–14 years, from the neighborhood were invited to participate in the health promotional activities by a community representative known as health promoter using snowball-sampling. Between 8-12 families participated in the multi-staged focus groups over a period of six months. Data was analyzed using qualitative content analysis.

Results: Three main themes emerged from the analysis including meaningful social interactions, family dynamics, and health trajectories. The mothers in the study appreciated the social aspects associated with their participation; however, they also felt that gaining knowledge was the focus not mere social interaction. Aside of social interactions participants also recognized the role of family dynamics primarily the interactions within the family, family structure and traditional practices as influencing oral health related behavior among children. Participants also reported to have experienced a change in general health through behavioral change. They started to understand the association between general health and oral health after participation that further motivated them to follow healthy behavioral routines.

Conclusions: The results from this study show that oral health promotion through reflection and dialogue with the communities together with other actors may have the potential to influence behavioral change and empower participants to be future ambassadors for change.

Strengths and limitations of this study

- Involving community members throughout the research process contributed to the development and implementation of need-based health promotional activities.
- Change in behavior was influenced by knowledge mobilization, reflection and dialogue among participants and not through a pre-determined intervention.
- The health promoter had a critical role in bridging between the research team and the community.
- The discussions in the group led to the development of a culturally adaptive sugar brochure that was useful to the community as well as health care providers.
- Non- participation of fathers may have been a potential source of selection bias.

Introduction

There has been an overall improvement in oral health status of the Swedish population in the past decades owing to the advancements in public dental services and state financed insurance policies [1, 2]. However, large discrepancies in oral health do exist [1, 3-7]. The level of inequalities are not substantially different between the different regions in Sweden but rather between small areas within the major cities, where there is a concentration of subgroups in marginal or vulnerable situations [3]. These socially deprived groups frequently include heterogeneous populations who differ by their ethnicity, historical background, culture, and practices related to health in comparison to the majority population [8]. Oral health disparities have been on the rise owing to challenges like lack of knowledge and poor social policies, unavailability of context-based information, and most importantly the disjunction between oral and general health [9]. The disjunction is owing to the fact that the current dental care system globally as well as in Sweden, consider merely the individual behavioral risk factors while addressing oral health problems. However, socio-cultural as well as policy related aspects which are key determinants of not only oral health but also general health and well-being is widely ignored. Health care providers tend to look at diseases in isolation rather than employing a collaborative approach to address health from a broader perspective. Thus widening the gap between oral and general health and increasing the burden of disease among socio-culturally different and disadvantaged subgroups of the population [10-13]

Since the early part of the twentieth century, there has been a global drive in reducing health inequalities [14, 15]. Health inequalities in general are associated with various social determinants including living conditions, employment status, and childhood conditions as well as aging [16]. These determinants also apply to oral health disparities. Moreover, oral diseases also share risk factors with other non-communicable diseases and are associated with cardiovascular disorders, and diabetes [17-22]. According to the World Health Organization,

oral health is an integral part of general health and is fundamental to overall wellbeing and quality of life. Thus, addressing oral health disparities is an inevitable part in health promotional activities aiming to reduce health disparities [23]. Oral health impairments have a considerable impact on the quality of life of affected individuals both functionally and esthetically [24-26]. Dietary habits, oral hygiene and use of fluoride are cornerstones for good oral health, preventing the occurrence of caries and periodontal disease. Irregular dietary habits and excessive sugar intake between meals, and frequent intake of high sugar diet are leading causes for caries in young children [27]. Numerous studies have explored the association between diet and oral health since the early nineteenth century. The production and consumption of food containing added sugars such as fruit juice concentrates, syrups and sweet candies has been on the rise particularly among young adults and children [28]. Poor oral hygiene is the key determinant in the occurrence of dental caries and periodontal disease as it initiates bacterial infestation, but the bacterial action in the oral cavity is triggered by the diet consumed [29]. High consumption of fermentable carbohydrates, which predominantly contain free sugars and starch, provokes bacterial action leading to destruction of tooth structure. Therefore, the WHO recommends limiting free sugar intake and replacing it by increasing the consumption of fresh fruits and vegetables, nuts, seeds and wholegrain starch-rich foods in an attempt to promote healthy diet and prevent dental caries and periodontal disease [28-30].

Dental caries also known as tooth decay is one of the most common preventable disease in children globally [23, 31, 32]. Cariological risk assessment among younger children is important as caries in early childhood progresses more rapidly since the enamel is thinner in the primary teeth than in the permanent teeth. Caries incidence in preschool age increases the risk of caries in adolescence and later in life [33]. Moreover, caries impairs the quality of life of children by disrupting vital everyday functions including eating, swallowing and speaking

[2]. Children with dental caries tend to have poor self-image and self-esteem [21, 23, 34]. Furthermore, caries may lead to adverse effects including reduced social interaction, pain, discomfort, disturbances in the development of occlusion, stress and depression [31]. According to previous studies, dental caries was twice as common among non-Swedish children and adolescents belonging to socioeconomically distressed families compared to their Swedish counterparts [1, 3-7]. Determinants for dental caries in immigrant children include parents' education level and ability to assimilate to Swedish dietary conditions since they are not often similar to the dietary patterns of immigrant families [3]. Parents in a socially vulnerable environment may need community support to establish good dietary and oral hygiene habits, including using fluorides, as part of preventing diseases of the oral cavity. In vulnerable areas, oral health problems may be part of a number of different social problems and a number of actors in the community, such as maternal care, child health care, pharmacies may need to make joint efforts to provide health interventions for families with different cultural backgrounds [5-7].

The Swedish dental care have had a strong tradition of preventing caries in children and adolescents. In cooperation with the National Board of Health and Welfare, the county councils have carried out caries risk assessment among children and adolescents since 1985 and continuous statistics on children and young people's oral health enables monitoring of caries development over time. Since the 1960s, there has been a steady decrease in caries prevalence among children owing to the effective and timely preventive measures implemented by the Swedish dental care. Despite these efforts caries prevalence is considerably higher among selected subgroups of the Swedish population who are more often from socially disadvantaged backgrounds. Studies based on Eurobarometer surveys have identified that socially disadvantaged populations frequently lack knowledge on self-care including practice of good oral hygiene, and other factors influencing oral diseases like diet

and use of fluorides [35]. This is especially true concerning children in disadvantaged communities who experience more caries than their Swedish peers. The Swedish dental services are provided free of cost for those under 23 years and frequently prioritize promotion and prevention. Nevertheless, these efforts have been insufficient in providing dental care without disparities. Children and young adults are invited through a recall system by the public dental service. However, children from socially disadvantaged settings are less regular in attending these visits. There has been a lower level of utilization of dental care despite the increased need among socially disadvantaged migrant groups [1, 3, 4]. A study in the Stockholm region showed that teenagers frequently missed the yearly visits and consulted the dentist only when in pain, most often with advanced carious lesion, which could have been identified and treated in time with regular contact [35]. Oral health behaviors are mediated to children through their parents with the support of the regional dental care [3, 4]. Often immigrant parents are unaware of the support services that are available due to recognized practical barriers such as language difficulties and health literacy. Parents also have different expectations from the health care system, which are based on their experiences from their own home country [36, 37].

Most of the information available in the Swedish dental care is evidence-based, but lacking contextual adaption. Traditional values and family practices influences the attitude towards health and how communities value oral health as well as what is considered as a standard for good health [3, 4, 9, 37]. An understanding of specific populations, their socio-economic position and the influence of their traditional practices and above all the influence of all of these factors on their health behavior is necessary to improve utilization of dental care in socially disadvantaged groups. This will in turn contribute to reduced oral health disparities [3, 4, 6]

There is an acute need for appropriate interventions and services to effectively address the oral health disparities of the underserved. These interventions must be culture and context sensitive novel oral health promoting solutions and not merely based on the views of the concerned, but rather influenced by the active participation of the populations in need [38]. Active participation by representatives from the target groups is crucial for reducing the gap in knowledge as well as tackling and allocating resources that support specific community needs [39].

Community based participatory research (CBPR) is one such a method, which focuses on addressing the determinants of health from a social as well as environmental perspective through active engagement of the community members and other concerned actors throughout the research process [39]. Taking into account specific social requirements and increasing community engagement to improve health, CBPR has emerged as an alternative paradigm for health and social research [38, 39]. CBPR is considered a significant part of translational research, which helps to improve the health of specific communities, eliminate inequality and achieve equality in health through community empowerment [40]. The principles of CBPR are based on core concepts including, partnership and co-learning, capacity building or training community members to become future health ambassadors, knowledge production for societal transformation and prolonged commitment which facilitates achieving higher level goals like reducing disparities [38]. CBPR is a systematic effort to integrate active participation by the community in the process of decision making by creating a mutual understanding of local phenomena and practices specific to the community which contributes to the development of innovative strategies to promote social change [39]. Empowerment has been considered critical in the CBPR process although the phenomenon was not frequently explored while evaluating CBPR based health promotional activities. Empowerment is defined as the ability to control one's own life especially in relation to own health and well-

being [41]. Studies addressing oral health disparities focusing on diet and oral hygiene using the CBPR method involving multiple actors from the community, public sector, private sector as well as non-profit organizations are sparse.

The current study was part of a larger project Health Promoting Innovation in Collaboration. The aims of the main project was to develop and study health-promoting activities based on participatory research methods. Focus group interviews based on CBPR principles were conducted with residents in a socially disadvantaged neighborhood in year 2016. The interviews aimed at identifying measures to improve health among the residents. During the discussions the citizens in the neighborhood identified several problem areas where they needed help with including poor oral health, lack of access to physical activity, poor mental health, and lack of knowledge concerning health and healthy behaviors.

Health promotional activities were held as part of the larger project focusing on the challenges identified by the community members. The health promotional activities targeted behavioral change through knowledge mobilization using a participatory design focusing on key factors such as empowerment [39]. Knowledge mobilization is a process where reciprocal and complementary knowledge is shared between multiple actors, to promote multidirectional co-construction of knowledge. The basis for knowledge mobilization is interactions that create knowledge and reflections during and after the interactions that facilitate sense-making of the acquired knowledge [39]. Community members participated in all stages of the project including planning, implementation and evaluation. Representatives from the neighborhood known as health promoters were integral in coordinating the activities in the different workshops. In an international context, they are known as community health workers, and their role has been proven promising in participatory research driven initiatives [42, 43]. The health promoters are instrumental in identifying and recruiting participants, assists with language interpretation and above all inform about the cultural nuances of the

community to be considered by the research team, while approaching individuals for various activities. As members of the group of interest, they also have deep knowledge and experience of the common problems faced by these communities particularly in relation to access to health care [42].

Oral health was one of the challenge areas identified by the community and addressed among the activities initiated as a part of the larger project. This was considered a priority area since dental caries was on the rise in families with young children. The initiatives focused on oral hygiene, the role of fluoride as well as diet since the residents also perceived a lack of access to personal advice on diet and health in their area.

The aim of the current study was to explore the behavioral change initiated by a participatory community based health promotion targeting oral health in children and parents living in a socially disadvantage neighborhood in Southern Sweden.

Method

Context

The current study was based in a socially distressed neighborhood located in Malmö city in Southern Sweden. Majority of the population living in this neighborhood are non-Swedish speaking. According to a report from Swedish Intelligence Unit, this neighborhood has been considered one among the fifteen most vulnerable localities in the country [44]. The report also highlights challenges like high rate of unemployment, crime, low education levels and poor health among residents which was also supported by prior research concerning high incidence of risky health behaviors among citizens in this neighborhood [45, 46].

Participants and Actors

The health promoter involved with the oral health related activities sent information about the activities and invited families with children between 7-14 years to participate in the meetings. Initially a few families identified by the health promoter volunteered to participate during the first session. More participants were later recruited through purposeful snowball sampling, mainly through spreading information through word of mouth. A total of 12 families were regularly involved in the activities. Although no specific demographic information was collected from the parents concerning the family structure, parental educational status and employment, it emerged from the discussions that quite a few of the mothers in the group were employed. Almost all families had three children, aged between 2 years – 12 years. Most of the families were from Middle Eastern countries. During the initial meetings, children were present together with their fathers and mothers. Eventually only the mothers participated regularly together with their children. There were 8-12 mothers during each of these 9 sessions and about 15 children during each meeting.

Aside from the participants and academic partners the research team included representatives from the public and private sectors as well as non-profit organizations affiliated to the project such as the Primary care, Pharmacy, Save the Children and TePe Oral Hygiene Products were also present. The private actors were present to listen and understand participant needs and not for marketing their products. Not all actors were however present in all meetings; their presence was determined by the theme discussed on the different occasions.

Design

The current study is a participative action research study with a qualitative approach where multistage focus group interviews were the mode of data collection. Multistage focus groups are characterized by the same group of persons exploring different themes during several meetings [47]. This method was inspired by Paul Freire's culture circles where the aim is to foster a participatory experience with an emphasis on dialogue and reflective action in response to an emancipatory health education [48]. The power relations are balanced within the circle, where one-person facilitates the discussions and debates by initiating the process. The facilitator then leaves it to the group to take responsibility for the progress in the inquiry process through self-reflections and sharing individual knowledge and experiences with each other. The dialogues help elevate the participants' experiences to a higher level of abstraction. The focus groups deduce individual learning, as well as collective ways of thinking through reflection and dialogue within the group. Freire states that the consequence of offering knowledge via dialogue as a tool empowers groups [49] and such an empowerment may lead to behavioral change [50]. During each meeting, the participants try to identify a common problem in the community, explore the problem further to identify resources and solutions while simultaneously implementing them to bring about transformation [48, 51].

Data Collection

Preliminary meeting

The families who agreed to participate met at nine different occasions once in two weeks over a period of six months beginning in September 2018. The first step in the multistage focus groups was to understand the participants' perceptions on oral health. Prior to the initiation of the actual activity sessions, the research team used a participatory research approach photovoice, to assess the complex phenomenon of diet from a sociocultural perspective among children. In this method photography is used a tool to understand the factors surrounding the actual problem in consideration, from within the context of the participants. This is also a form of qualitative research where the photos act, as a focal point to initiate discussion and promote better understanding of participants needs. This method helps overcome language and communication barriers and enhances discussions within the group [52, 53].

The children were requested to bring pictures of healthy and unhealthy food and discussions were initiated based on their photos. In addition, they were also asked to take pictures of their toothbrush, as a base for discussing oral hygiene habits. Children sent the photographs via Whatsapp to the health promoter a few days prior to the scheduled introductory meeting. Photographs sent by the children were compiled, printed and later presented to the children for review together with the rest of the group. One of the team members initiated the discussion with the children using the pictures they sent and led the discussions.

Actions points from the preliminary meeting

Through the discussions during the preliminary meeting, it emerged that the children consumed a high amount of sugar as part of their daily diet. The children also expressed a dislike for the lunch served at school. It came to be known that most of the children did not

eat breakfast owing to time constraints, family situation and cultural aspects. Through post discussion with parents it was understood that parents had limited control over their children's' dietary choices. With regard to oral health and oral hygiene children frequently visited the dentist as they had pain in the tooth and some had fillings and a few even had teeth extracted in early childhood. Concerning oral hygiene, there was a lack of awareness concerning fluoride use and its importance for oral health in children. It appeared that despite having several tooth decays they were not informed about the role of fluorides in caries prevention. The session was followed by debriefing and discussion with parents to understand their concerns about oral health of their children and the families in general. When discussing with their parents, it emerged that parents were not satisfied with the tooth brushing done by their children. The children did not permit parents to help them with brushing despite being advised by the dentist or dental hygienist. In conclusion, parents felt the need for dietary advice focusing on the different meals, breakfast, lunch and dinner. In addition, they also wanted to gain more knowledge on oral hygiene habits. They preferred all sessions to be in the presence of the children since they would follow the advice of others better than they would do if the parents told them the same thing.

In the consecutive occasions, dialogue-based teachings or reflective dialogues were facilitated by experts in the fields related to address different challenges that emerged in the first meeting. Behavioral change through educating parents was driven by the reflective dialogues. Previous studies [54] state that reflective dialogue-parental education is an effective method to enhance parental awareness and improve parenting skills through confidence building which is promoted by social support and peer influence. The discussions in the groups were predominantly held in Swedish and interpreted in Arabic by the health promoter for the benefit of some parents who could not speak Swedish. At the beginning of every meeting, families had the opportunity to provide feedback from the previous session. They also

discussed their ability to make changes inspired by what was learnt from their participation and the challenges faced in doing so. All discussions were audiotaped with the consent of the families. A member of the researcher team also acted as an observer and was responsible for taking notes during each meeting.

Data Analysis

One of team members [RR] reviewed audio recordings repeatedly to develop a content log of the discussions as well as summary. Listening to the recordings, several times facilitated rapid identification of codes together with the help of the observational notes. Two other members from the research team who were not involved in the data assimilation process listened to the recordings to complement the preliminary analysis performed by the first researcher [EC, MR]. Following this, the researchers discussed and reflected on their findings together and came to consensus over a final list of codes. Another researcher [SB] who was also involved with the focus group discussions further read the final list of codes and confirmed them. The discussed codes were placed under categories and each category was further defined in detail to identify overarching themes. While data extraction was done using rapid identification of themes from audio recordings (RITA) method, qualitative content analysis with an inductive approach [55], was used to identify themes relevant to the research goals. The RITA method has previously been established as a method that yields prompt and detail results from qualitative data while also being less time consuming and less labor intensive [56-58].

Qualitative Rigor

Results from qualitative studies are evaluated based on certain criteria such following Guba and Lincoln's criteria [59] as factors that predict the authenticity of the results. According to

these criteria, the quality of results depends on the methods of data collection and the technique of data interpretation. The current study is built on the CBPR principles of co-learning and sharing thereby holding the contact between the researcher and community member's closer; thus, enabling better understanding and interpretation of information provided. Furthermore, the involvement of the health promoter at the different stages of the research process ensured open communication. This provided an opportunity for the participants to share trustworthy accounts of experiences to other members in the group ensuring credibility. The research team made observational notes describing the context to support the audiotaped data which contributed to transferability of the findings. Dependability was attained by involving a third researcher who was not involved in the initial data collection and analysis to review the coded data. To achieve confirmability, audio recordings and the observational notes were rechecked in iterations also by the third member from the research team.

Findings were shared with participants and reconfirmed when necessary.

Issues related to reflexivity was address using constant communication with the participants after each meeting, through peer debriefing, as well as triangulation by including several members in the research team in the focus groups as well as analysis of audio recordings. Self-reflexivity or personal reflexivity of the members of research team was considered rather positive since it gave the possibility for the team to reflect on power and privilege issues in relation to the context. This is also in line with guidelines indicated by prior work in participatory research [60].

Ethical Considerations

The Regional Ethical Review Board in Lund approved the study (DNR 2016/824). All participation was voluntary, and the participants were informed that they could leave the

discussions at any time without any explanation or consequences. The parents received detailed information regarding the purpose and nature of the study, and were requested to provide written informed consent before enrollment. Parents were requested to consent their own as well as their children's participation. All invited participants consented both their own participation as well as that of their children. The children also gave a verbal consent.

Findings

Three main themes including meaningful social interactions, family dynamics, and health trajectories were identified on exploring reflective thoughts and discussions in the focus groups with an aim to understand the process of changed behavior within the group. Social interactions, family dynamics, and health trajectories were considered as factors influencing behavioral change among mothers and children.

Meaningful social interactions

The mothers reported in the beginning that they agreed to participate in this study since they trusted the health promoters. However, after a few meetings they began to enjoy the social aspects of being with new people especially since they would otherwise sit idly at home.

"In the beginning I came here because we knew the "health promoter". After coming here a few times, we started to interact with the others in the group. Now we do activities outside of this group, for example we go out on picnics or barbeque together. Coming here and meeting people is definitely better than sitting idle." (Mother of child aged 9 years, Meeting 8)

Although the mothers enjoyed the social aspects during the initial meetings, they began to look forward to interactions that are more purposeful and considered gaining knowledge as primary focus.

"It is not just for meeting others. It is good that I get information about healthy food and what is a good breakfast for both my children and me. I just do not go there every time to meet someone else. We can do that in a different way." (Mother of children aged 2-11 years, Meeting 8)

The mothers in the group believed that the discussions and information they received were better than what they had received from the nurses at the primary care. They highlighted the

importance of being in a group in the learning process since the discussions were interactive and not controlled or determined by the facilitators or field experts

"When we meet a nurse at a primary care center, they sound tired and disinterested and hence do not provide the same information we get here. It was not of good quality neither educational or motivating as we do here within the group." (Mother of child aged 6-10 years, Meeting 6)

The mothers felt that they were given not only the opportunity to gain new knowledge and learn, but also the possibility to discuss and share their own knowledge and experiences. They also gave and received tips from each other in the group.

"It was not just a lecture, we got to ask, discuss and learn from the experts and from each other. It was fun to give tips and suggestions to each other based on our experiences." (Mother of children aged 2-11 years, Meeting 7)

Some of the mothers were unsure from the beginning if they could make changes to their diet. After participation for a few weeks, they felt motivated and gradually started to make changes.

"In the beginning I was drinking 5-6 liters of juice a day, after being here I have reduced it to 1 liter per week. I initially thought that I can't but when I was told about the sugar content of the juice and learnt about others changing their dietary patterns, I too decided to change." (Mother of children aged 6-12 years, Meeting 7)

Towards the end of the sessions, several mothers expressed their interest in communicating the knowledge they gained to the rest of the community, as they believed that the information was important. They even went a step further and mentioned that they would like to join the research team in the future to support the mission to improve oral health among the population in the neighborhood.

"I want to be one among your team, you are few and there are many people who need help so I want to help others as you do." (Mother of children aged 2-11 years, Meeting 8)

Children in the group were also interested in spreading their knowledge to their friends and classmates. One of the children in the group had already begun speaking about sugar intake and oral health to his class.

"I told my classmates about why eating sugary things is harmful and how sugar affects the teeth. My teacher was impressed with me and wanted me to share more information in the class after each meeting." (Child 11 years, Meeting 6)

Family dynamics

The role of individual members in the family, bonding and interactions between family members together with socio-cultural or traditional values carried within the family, influence lifestyle and behavior of the children. Acculturation and migration also have an influence on the relationship between children and parents, specifically mothers. Thus, a sustainable change in diet of children is influenced by family dynamics.

Mothers in this study perceived that they had important responsibilities but were merely limited to executing actions with little influence on decision-making. This was considered as direct challenge in promoting dietary changes in the family.

"I am a woman I can decide only for myself, I cannot tell my husband what he has to eat. My children eat what their father eats. I drink a lot of tea and my children drink tea too. It is our tradition." (Mother of children aged 3-14 years, Meeting 2)

Children in the families acknowledged their traditional practices and consumed high amount of sugar as part of it. They believed that following parent's action was also associated with culture.

We drink tea as a family in the evenings and during weekend. I cannot drink tea without sugar in it. I usually put four teaspoons of sugar in my tea. That is how my parents drink too. It is a cultural thing." (Child aged 9 years, Meeting 1)

From the discussions with the children it emerged that they were almost alone when they ate breakfast so they ate whatever they found in this refrigerator.

"I eat breakfast alone and I eat whatever is available in the refrigerator. I mostly eat bread with Nutella, as it is easy to make. My mother goes to work and my father is still sleeping then. My brother never helps me even if I ask." (Child aged 8 years, Meeting 3)

Some mothers also believed they could not provide enough attention to their children's diet due to lack of time and a stressful life in Sweden. Mothers also believed that fathers could not help children as good as the mothers as men have low involvement in the upbringing of children. After participation in the activities, the mothers found a solution to this through the tips they got from fellow participants.

"I leave early to work and my children eat breakfast by themselves. My husband cannot prepare food and take care of the children, sometimes he forgets everything, he miss to put on their wooly caps in winter. It is cultural (Mother of children aged 6-10 years, Meeting 2)

Mothers valued the involvement of children in the activities since they recognized changes in children's behavior at home after participation. Children were more cautious about their diet and sought their parents´ help while brushing their teeth, which they refused to do earlier.

"The good thing is that we got to be here with our children, and that they also got to listen and learn. They have become more responsible at home; my son does not want to eat as many bananas as he did earlier because he has learned that it has more sugar. He wants me to help him brush his teeth; he would never allow me to do it before even if I insisted. "(Mother of children aged 2-11 years, Meeting 5)

Mothers were initially unsure about influencing the diet and lifestyle of their spouses, but when they made changes for themselves their husbands chose to do so too. In some households, women brought home information material from the meetings to convince their husbands.

"At first I thought it might be hard for me to influence my husband, but when I changed my own diet he chose to change his too" (Mother of children aged 2-11 years, Meeting 8)

"When I told him about sugar content in each food and showed the sugar brochure my husband was shocked and immediately decided to change."(Mother of child aged 11 years, Meeting 8)

Health trajectories

When the mothers initially volunteered to participate in the activity and attended the meetings, they were concerned about their children's oral health behavior and diet. From the initial discussions with parents and children it emerged that children frequently consumed sugar in form of candies, juices and drank tea with sugar, which was a part of their tradition. Parents were also worried since children frequently complained of toothache and some of them had several fillings or a lost tooth.

Some parents even believed that they needed some amount of added sugar for normal body function. Parents were unable to monitor and control their children's' sugar intake.

"I must have juice in the refrigerator all the time because my children want to drink juice once every hour. I cannot say no to them because they will not eat anything else. I can't help but buy juice as I also like it." (Mother of children aged 6-12 years, Meeting 1)

After participation in the activities, mothers reported a sense of satisfaction and relief since they were able to take control over their situation and bring about change, promoting a healthier lifestyle for their children. This in turn made them happier and they slept better.

"I felt bad when I realized that it was me who bought juice and sweets. I understood that if I stop buying things it would help my family. Since I did that, I sleep better because I know I have provided healthy food to my children." (Mother of children aged 6-12 years, Meeting 8)

Children in the group were particularly excited about learning to brush their teeth from experts and the use of different kind of toothbrushes. They also spoke about the relationship between healthy teeth and healthy living after participation in the discussions.

"It was fun to see all the different brushes. I never knew there existed so many. I learnt to brush my teeth. I think that we must brush our teeth well since it makes us feel healthy." (Child aged 8 years, Meeting 7)

Mothers began to understand the influence of diet on their health more distinctly after participation in the activities. Mothers reported change in self-perceived health owing to behavioral change after participation in the activities.

"Since I made changes to my diet, I started feeling fresher and healthier. I was at the doctor last week and he was surprised because I have lost weight." (Mother of child aged 9 years, Meeting 8)

Participants began to understand the connection between oral health and general health and well-being after having participated in the activities.

"Through participation in this activity I have learned about the connection between oral health with general health. I have actually seen a change in my physical health." (Mother of children aged 2-11 years, Meeting 8)

Discussion

Participation in the health promotional activities led to changed oral health related behavior, together with a tendency of increased empowerment, and an increased control over health among both mothers and children, which in turn extended into the entire family as illustrated in the main findings social interactions, family dynamics and course of health in general.

The current study shows that a participatory dialogue and reflection targeting behavioral change taking into account the actual needs of the community may initiate lifestyle changes among socially disadvantaged immigrant families compared to mere personal dietary counselling in primary care centers or at the dental clinics. This is in line with a previous study [61] which shows that dietary counselling offered by health care workers is frequently inconsistent, unclear and beyond all not culturally tailored and hence is not effective in promoting dietary changes. Participants in this study, especially mothers from socially disadvantaged backgrounds viewed this activity as a facilitator for change in oral health related lifestyle through provision of need driven support and knowledge. The role of mothers as important channels for behavioral change in the families is in line with a previous study based on oral health educational interventions involving immigrant families with children living in Australia [62]. However, the intervention offered in the Australian study was predetermined intervention provided by trained members from the community unlike in the case of this study the health promotional activities were purely participatory in that all the oral health related education was in the form of dialogue exchange between participants and the different actors within the project. In addition, the health promotional activities targeting behavioral change in the current study was implemented over a longer period with frequent visits and involved children aged 7-14 years in contrary to the Australian study were the intervention was provided for 3-4 weeks and children of younger age (1-3 years) were included. Involving older children in the discussions benefitted in that they were also active

during all sessions, had the opportunity to ask questions, learn from experts, and thereby reported to have made changes in their lifestyle.

The interaction between individuals in a group exerted a strong influence on the behaviors, which was beyond the mere social aspect of meeting people to break isolation. The process involved utilization of collective knowledge to bring about changes in daily life through mutual sharing and motivating each other. These results are in line with discussions in a review study [63] that shows that participation in interactive lifestyle interventions in small groups composed of individuals in similar situations who are motivated to change their lifestyle are known to promote behavioral and lifestyle changes even among harder to convince participants in the group by being role models [63]. Similarly, according to an earlier study , social interaction between children is known to help in shaping their cognition, altering their attitudes, beliefs as well as understanding of reality that in turn promotes behavioral changes [64].

The stages leading to change in parental conception which facilitated behavioral changes also reflect on the four conditions described by a prior study on the effects of reflective dialogue parental education including awareness of one's current conception, dissatisfaction with one's current conceptions, support and understanding from others, exposure to alternate ways, opportunities for encouragement and reflection [54]. During the initial meetings, mothers in the group became more conscious and aware of what constituted the meals they served their families through reflecting on the images of their own breakfast. Many of them had not thought about the health aspects of ingredients they used to prepare meals. They merely followed family traditions. However, through participation in the group meetings they realized that they had a significant role in promoting healthier diet to the rest of their family. Although they were frustrated in the beginning, they found support from other participants in the group who were in similar situations. The support, understanding, mutual respect and

caring shared among each other in the group made the mothers psychologically stronger and thus they did not feel pressured or guilty. They rather became determined and welcomed the alternative conceptions they were exposed to both from the different actors providing knowledge as well as through interaction with other members in the group with varying perceptions. The participants moved from a stage of seeking knowledge to sharing knowledge through providing tips to one and another as well as to their friends and relatives in the community. The mothers expressed a feeling of confidence in self and reflected a tendency of being empowered, which they were lacking in the beginning of the study when they really felt powerless due to their inability to take control over their children's oral health related lifestyle.

Practical Implications

It became known through this study that brochures and health education material used in the Swedish health care were adapted to the Swedish context and were considered less useful for needy communities. The participants believed that an educational material showing sugar content in various food products would help understand sugar intake among families in socially disadvantaged neighborhoods. As a part of the activities, participants learnt to read and understand the ingredients list printed in the package of different food products. They also learnt to convert the quantity of sugar in grams to sugar cubes since children which helped them communicate and spread the knowledge they gained with others. Participants gathered photographs of food products and some culturally specific dishes which they wanted to include in a new brochure. Together with the actors in the research team and a trained dietist, the participants developed a sugar brochure. The sugar brochures where printed in multiple copies by TePe and were distributed to the participants. The private actor TePe had the role of

only listening and understanding participant needs as they played a central role in printing the brochure material. It must be noted that they did not have an influence on participants with regard to the development of the brochure. The brochure was also shared with the primary care, dental care and pharmacy for further dispersal of the material. The participants, both mothers and children found the brochure as a concrete tool for informing their family and friends in the community about the harmful effects of sugar consumption. The mothers in the group became oral health ambassadors in the community and started an initiative "Fight against sugar intake. They organized small gatherings with other women in the community to talk about the knowledge they gained from their participation in this study, together with the help of the brochure. Some of the children in the group who expressed interest to learn more about oral health, diet and healthy lifestyle were specially educated by experts in TePe over a period of one month with one lecture a week. After participation in the educational sessions, the children were certified as child oral health ambassadors. These child oral health ambassadors began spreading their knowledge in their respective schools.

Limitations

A notable feature in multistage focus groups used in the current study is that participant dynamics may change during subsequent meetings in that new families take part or some of the original families do not taken part in some of the meeting series. According to previous studies, the introduction of new members have a positive effect in that new discussions that emerge and more knowledge is generated [48]. However, in the current study it must be noted that eight to twelve families attended almost all meetings while there were also few new families in every occasion, which steered new discussions and new perspectives that benefitted even those families that come regularly. However, the participants were reassured

at the beginning of each meeting that all of their opinions and views within the group were equally important. In addition, the presence of the health promoter, who was also a representative of the community as facilitator of the discussions also helped participants to be more involved during the discussions and thereby helped reducing power issues. The rapid identification of themes from audio recordings may be considered a methodological limitation. However, in contrast to the original method of listening to the audio for three minutes [56], the themes were identified after listening to the entire audio recording several times. In addition, extensive field notes were collected during each of the nine sessions, which was used as complementary information to the audio recordings during analysis. Aside of this the research team also had a deeper understanding of the participants views from a contextual perspective owing to their prior engagement with participants in the trust-building phase, which was also enhanced by the involvement of health promoter. Another potential limitation in this study is the non-participation of fathers, which may have introduced a selection bias. This however does not undermine the value of the findings from this study. Fathers in this study decided not to participate in the activities since mothers had the primary role of raising children and steering their behavior in these communities. This is also in line with prior research on family traditions and significant role of mothers in raising children [65, 66]. The current study could also have benefited from inclusion of a quantitative assessment to explore actual behavior change and improvement in oral health after participation in the activities. Such an evaluation is also planned within the groups using a participatory approach where health promoters will have an active role in distributing health surveys and analyzing them together with researchers.

The presence of a private company among the actors involved in the project may raise questions related to conflict of interest. However, the relationship between the private company and the research project was mediated by the mutual goal of creating of social value

for disadvantaged populations. Through their presence in the project, the company aimed at understanding user needs in order to develop user-driven products and solutions for improved oral health in socioeconomically distressed communities. The company had no financial gains through their participation in the research project. The head of their research and development section was the primary representative of the company in the project. Additionally, the representative is also a specialist in pediatric dentistry, which made her presence useful since she could share her valuable knowledge, and experiences with the research team as well as participants. Previous studies have also considered academic-private partnerships in health research as an advantage rather than a limitation, because through such partnership emerges innovative strategies and positive effects which helps achieve higher public health goals [67, 68].

Conclusion

The current study highlights the importance of working with the whole family, to ensure sustainable lifestyle changes. Placing the focus on both the process of change as well as the action paved ways to explore how families experienced their participation in the activities offered as well the determinants of behavioral change. Providing mothers and children with the knowledge and skills to promote oral health behaviors influences not only their immediate family but also their communities or social groups. However, the success of knowledge transfer is mediated by the principles of participatory research that strengthens and empowers individuals thereby building a healthy society decrease from health disparities.

Conflicts of interest

The authors declare no financial, personal or other conflicts of interest.

Availability of data and materials

The audio recordings analyzed during the current study are not publicly available due copyrights issues and GDPR regulations but are available from the corresponding author on reasonable request.

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Authors' Contributions

All authors participated in the design of the study. RR, SB, AO and MR performed the study. RR, MR, SB and EC analyzed the data. RR wrote the manuscript. RR, AK, EC, SB, AO and MR revised the manuscript critically. All authors read and approved the final manuscript.

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Reporting checklist for qualitative study.

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		Reporting Item	Page Number
Title			
	#1	Concise description of the nature and topic of the study identifying the study as qualitative or indicating the approach (e.g. ethnography, grounded theory) or data collection methods (e.g. interview, focus group) is recommended	1
Abstract			
	#2	Summary of the key elements of the study using the abstract format of the intended publication; typically includes background, purpose, methods, results and conclusions	2
Introduction			
Problem formulation	#3	Description and signifcance of the problem / phenomenon studied: review of relevant theory and empirical work; problem statement	3-8

Purpose or research question	#4	Purpose of the study and specific objectives or questions	9
Methods			
Qualitative approach and research paradigm	#5	Qualitative approach (e.g. ethnography, grounded theory, case study, phenomenolgy, narrative research) and guiding theory if appropriate; identifying the research paradigm (e.g. postpositivist, constructivist / interpretivist) is also recommended; rationale. The rationale should briefly discuss the justification for choosing that theory, approach, method or technique rather than other options available; the assumptions and limitations implicit in those choices and how those choices influence study conclusions and transferability. As appropriate the rationale for several items might be discussed together.	11
Researcher characteristics and reflexivity	#6	Researchers' characteristics that may influence the research, including personal attributes, qualifications / experience, relationship with participants, assumptions and / or presuppositions; potential or actual interaction between researchers' characteristics and the research questions, approach, methods, results and / or transferability	16
Context	#7	Setting / site and salient contextual factors; rationale	10
Sampling strategy	#8	How and why research participants, documents, or events were selected; criteria for deciding when no further sampling was necessary (e.g. sampling saturation); rationale	10-11
Ethical issues pertaining to human subjects	#9	Documentation of approval by an appropriate ethics review board and participant consent, or explanation for lack thereof; other confidentiality and data security issues	15
Data collection methods	#10	Types of data collected; details of data collection procedures including (as appropriate) start and stop dates of data collection and analysis, iterative process, triangulation of sources / methods, and modification of	11

		procedures in response to evolving study findings; rationale	
Data collection instruments and technologies	#11	Description of instruments (e.g. interview guides, questionnaires) and devices (e.g. audio recorders) used for data collection; if / how the instruments(s) changed over the course of the study	11
Units of study	#12	Number and relevant characteristics of participants, documents, or events included in the study; level of participation (could be reported in results)	10-11
Data processing	#13	Methods for processing data prior to and during analysis, including transcription, data entry, data management and security, verification of data integrity, data coding, and anonymisation / deidentification of excerpts	14
Data analysis	#14	Process by which inferences, themes, etc. were identified and developed, including the researchers involved in data analysis; usually references a specific paradigm or approach; rationale	14
Techniques to enhance trustworthiness	#15	Techniques to enhance trustworthiness and credibility of data analysis (e.g. member checking, audit trail, triangulation); rationale	14-15
Results/findings			
Syntheses and interpretation	#16	Main findings (e.g. interpretations, inferences, and themes); might include development of a theory or model, or integration with prior research or theory	16-22
Links to empirical data	#17	Evidence (e.g. quotes, field notes, text excerpts, photographs) to substantiate analytic findings	16-22
Discussion			
Intergration with prior work, implications, transferability and contribution(s) to the field	#18	Short summary of main findings; explanation of how findings and conclusions connect to, support, elaborate on, or challenge conclusions of earlier scholarship; discussion of scope of application / generalizability; identification of unique contributions(s) to scholarship in a discipline or field	23-26

Limitations	#19	Trustworthiness and limitations of findings	26-27
Other			
Conflicts of interest	#20	Potential sources of influence of perceived influence on study conduct and conclusions; how these were managed	28
Funding	#21	Sources of funding and other support; role of funders in data collection, interpretation and reporting	29

BMJ Open

Understanding behavioral changes through community based participatory research to promote oral health in socially disadvantaged neighborhoods in Southern Sweden

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Understanding behavioral changes through community based participatory research to promote oral health in socially disadvantaged neighborhoods in Southern Sweden

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Abstract

Objectives: Inequalities in oral health have been on the rise globally. In Sweden, these differences exist not between regions, but among subgroups living in vulnerable situations. This study aims at understanding behavioral change after taking part in participatory oral health promotional activity among families living in socially disadvantaged neighborhoods in Southern Sweden.

Setting: The current study involved citizens from a socially disadvantaged neighborhood in Malmö, together with actors from the academic, public and private sectors. These neighborhoods were characterized by high rates of unemployment, crime, low education levels and most importantly poor health.

Participants: Families with children aged 7–14 years, from the neighborhood were invited to participate in the health promotional activities by a community representative, known as a health promoter, using snowball sampling. Between 8-12 families participated in the multistage focus groups over six months. Data were analyzed using qualitative content analysis.

Results: Three main themes emerged from the analysis, providing an understanding of the determinants for behavioral change, including meaningful social interactions, family dynamics, and health trajectories. The mothers in the study valued the social aspects of their participation; however, they believed that gaining knowledge in combination with social interaction, made their presence also meaningful. Further, the participants recognized the role of family dynamics primarily the interactions within the family, family structure and traditional practices as influencing oral health related behavior among children. Participants reported having experienced a change in general health owing to changed behaviour. They started to understand the association between general health and oral health that further motivated them to follow healthier behavioral routines.

Conclusions: The results from this study show that oral health promotion through reflection and dialogue with the communities, together with other stakeholders may have the potential to influence behavioral change and empower participants to be future ambassadors for change.

Strengths and limitations of this study

- Involvement of community members in the development health of promotional activities.
- Working with both parents and children together to promote oral health.
- Triggering knowledge mobilization through reflection and dialogue.
- Partnership between community members and different stakeholders facilitated by health promoters.
- Non- participation of fathers may have been a potential source of selection bias.

Introduction

There has been an overall improvement in oral health of the Swedish population in the past decades owing to the advancements in public dental services and state financed insurance policies [1, 2]. However, large discrepancies in oral health do exist [1, 3-7]. The level of inequalities are not substantially different between regions in Sweden but rather between small areas within the major cities, where there is a concentration of subgroups in marginal or vulnerable situations [3]. These socially deprived groups frequently include heterogeneous populations who differ by their ethnicity, migration status, historical background, culture, and practices related to health, in comparison to the majority population [8]. Oral health disparities have been on the rise owing to challenges such as lack of knowledge and poor social policies, unavailability of context-based information, and most importantly the disconnection between oral and general health [9]. This disconnection is a result of the current dental care system globally, as well as in Sweden, considering merely individual behavioral risk factors while addressing oral health problems. However, socio-cultural as well as policy related aspects are key determinants of not only oral health but also general health and well-being. Health care providers tend to look at diseases in isolation rather than employing a collaborative approach to address health from a broader perspective. Thus widening the gap between oral and general health and increasing the burden of disease among socio-culturally different and disadvantaged subgroups of the population [10-13]

Since the early part of the twentieth century, there has been a global drive in reducing health inequalities [14, 15]. Health inequalities in general are associated with various social determinants including living conditions, employment status, childhood conditions as well as aging [16]. These determinants also apply to oral health disparities. Moreover, oral diseases also share risk factors with other non-communicable diseases and are associated with cardiovascular disorders and diabetes [17-22]. According to the World Health Organization (WHO), oral health is an integral part of general health and is fundamental to overall well-

being and quality of life. Thus, addressing oral health disparities is an inevitable part in health promotional activities aiming to reduce health disparities [23]. Oral health impairments have a considerable impact on the quality of life of affected individuals both functionally and esthetically [24-26].

Poor oral hygiene and excessive or frequent intake of sugar between meals are leading causes for caries and poor oral health in general [27]. The consumption of fermentable carbohydrates containing added sugars have been on the rise, particularly among children and young adults [28]. High consumption of fermentable carbohydrates provokes bacterial action leading to the demineralization of tooth enamel, that might lead to the development of caries [29]. The WHO recommends limiting free sugar intake and replacing it by increasing the consumption of fresh fruits and vegetables, nuts, seeds and wholegrain starch-rich foods, together with practicing good oral hygiene as measures to prevent dental caries, periodontal disease and promote oral health. Tooth brushing with fluoridated toothpaste in combination with a well-balanced diet is the foundation for good oral health [28, 30, 31].

Dental caries is one of the most common preventable disease in children globally [23, 32, 33]. Cariological risk assessment among younger children is important as caries in early childhood progresses more rapidly since the enamel is thinner in the primary teeth than in the permanent teeth. Caries incidence in preschool age increases the risk of caries in adolescence and later in life [34]. Moreover, caries impairs the quality of life of children by disrupting vital everyday functions [2]. Children with dental caries tend to have poor self-image and self-esteem [21, 23, 35]. Furthermore, caries may lead to adverse effects including reduced social interaction, pain, discomfort, disturbances in the development of occlusion, stress and depression [32]. According to previous studies, Dental caries was has been shown to be twice as common among non-Swedish children and adolescents belonging to socioeconomically distressed families compared to their Swedish counterparts [1, 3-7]. Determinants for dental caries in

immigrant children include parents' education level and ability to assimilate to Swedish dietary conditions since they are not often similar to the dietary patterns of immigrant families [3]. Parents in a socially vulnerable environment may need community support to establish good dietary and oral hygiene habits, including using fluoride, as part of caries prevention. In vulnerable areas, oral health problems may be part of a number of different social problems and a number of actors in the community, such as maternal care, child health care, and pharmacies may need to make joint efforts to provide health interventions for families with different cultural backgrounds [5-7].

The Swedish dental care system has a strong tradition of preventive dental care in children and adolescents. Since the 1960s, there has been a steady decrease in caries prevalence among children owing to the effective and timely preventive measures implemented by the Swedish dental care system. Despite these efforts, caries prevalence is considerably higher among selected subgroups of the Swedish population who are more often from socially disadvantaged backgrounds. Studies based on Eurobarometer surveys have identified that socially disadvantaged populations frequently lack knowledge on self-care, including practice of good oral hygiene, diet and use of fluorides [36]. This is especially true concerning children in disadvantaged communities who experience more caries than their Swedish peers. Swedish dental care including preventive measures and treatment are provided free until the age of 23. Nevertheless, these efforts have been insufficient in providing dental care without disparities. Children from socially disadvantaged settings are less regularly attending these visits. There has been a lower level of utilization of dental care despite the increased need among socially disadvantaged migrant groups [1, 3, 4]. Oral health behaviors are mediated to children through their parents with the support of the regional dental care [3, 4]. Often immigrant parents are unaware of the support services that are available due to recognized practical barriers such as language difficulties and health literacy. Parents also have different

expectations from the health care system, which are based on their experiences from their own home country [37, 38].

Most of the information available in the Swedish dental care is evidence-based, but lacking contextual adaption. Traditional values and family practices influences the attitude towards health and how communities value oral health as well as what is considered as a standard for good health [3, 4, 37]. An understanding of specific populations, their socio-economic position, the influence of their traditional practices and above all the influence of all of these factors on their health behavior is necessary to improve utilization of dental care in socially disadvantaged groups. This will in turn contribute to reduced oral health disparities [3, 4, 6, 9]

There is an acute need for appropriate interventions and services to effectively address the oral health disparities of the underserved. These interventions must be culture and context sensitive novel oral health promoting solutions and not merely based on the views of the concerned, but rather influenced by the active participation of the populations in need [39]. Active participation by representatives from the target groups is crucial for reducing the gap in knowledge as well as tackling and allocating resources that support specific community needs [40].

Community based participatory research (CBPR) is one such a method, which focuses on addressing the determinants of health from a social as well as environmental perspective through active engagement of the community members and other concerned actors throughout the research process [40]. Taking into account specific social requirements and increasing community engagement to improve health, CBPR has emerged as an alternative paradigm for health and social research [39, 40]. CBPR is considered a significant part of translational research, which helps to improve the health of specific communities, eliminate inequality and achieve equality in health through community empowerment [41]. The principles of CBPR

are based on core concepts including, partnership and co-learning, capacity building or training community members to become future health ambassadors, knowledge production for societal transformation and prolonged commitment which facilitates achieving higher level goals like reducing disparities [39]. CBPR is a systematic effort to integrate active participation by the community in the process of decision making by creating a mutual understanding of local phenomena and practices specific to the community which contributes to the development of innovative strategies to promote social change [40]. Empowerment has been considered critical in the CBPR process although the phenomenon was not frequently explored while evaluating CBPR based health promotional activities. Empowerment is defined as the ability to control one's own life especially in relation to own health and well-being [42]. Studies addressing oral health disparities focusing on diet and oral hygiene using the CBPR approach involving multiple actors from the community, public sector, private sector as well as non-profit organizations are sparse.

The current study was part of a larger project Health Promoting Innovation in Collaboration. The aims of the main project was to develop and study health-promoting activities based on participatory research methods. Focus group interviews based on CBPR principles were conducted with residents in a socially disadvantaged neighborhood in 2016. The interviews aimed at identifying measures to improve health among the residents. During the discussions, the citizens in the neighborhood identified several problem areas where they needed help, including poor oral health, lack of access to physical activity, poor mental health, and lack of knowledge concerning health and healthy behaviors.

Health promotional activities were held as part of the larger project focusing on the challenges identified by the community members. The health promotional activities targeted behavioral change through knowledge mobilization using a participatory design focusing on key factors such as empowerment [40]. Knowledge mobilization is a process where reciprocal and

complementary knowledge is shared between multiple actors, to promote multidirectional co-construction of knowledge. The basis for knowledge mobilization is interactions that create knowledge and reflections during and after the interactions that facilitate sense-making of the acquired knowledge [40]. Community members participated in all stages of the project including planning, implementation and evaluation. Representatives from the neighborhood, known as health promoters, were integral in coordinating the activities in the different workshops. In an international context, they are known as culture brokers, and their role has been proven promising in participatory research driven initiatives [43, 44]. However, the health promoters working in this project had a unique role since they were educated in participatory research methods. These health promoters were instrumental in identifying and recruiting participants, assisting with language interpretation and most importantly to inform the research team about the cultural nuances of the community.

As members of the community, they also had deep knowledge and experience of the common problems faced by these communities particularly in relation to access to health care [43].

Oral health was one of the challenge areas identified by the community and addressed among the activities initiated as a part of the larger project. This was considered a priority area since dental caries was on the rise in families with young children. The initiatives focused on oral hygiene, the role of fluoride as well as diet since the residents also perceived a lack of access to personal advice on diet and health in their area.

The aim of the current study was to explore the behavioral change initiated by a participatory community based health promotion targeting oral health in children and parents living in a socially disadvantage neighborhood in Southern Sweden.

Method

Context

The current study was based in a socially distressed neighborhood located in Malmö city in Southern Sweden. The majority of the population living in this neighborhood are non-Swedish speaking. According to a report from the Swedish Intelligence Unit, this neighborhood has been considered one of the fifteen most vulnerable localities in the country [45]. The report also highlights challenges like high rates of unemployment, crime, low education levels and poor health among residents which was also supported by prior research concerning high incidence of risky health behaviors among citizens in this neighborhood [46, 47].

Participants and Actors

The health promoter involved with the oral health related activities sent information about the activities two weeks ahead of the first meeting and invited families with children between 7-14 years to participate in the meetings. Initially a few families identified by the health promoter volunteered to participate during the first session. More participants were later recruited through purposeful snowball sampling, mainly through spreading information through word of mouth. A total of 12 families were regularly involved in the activities. Although no specific demographic information was collected from the parents concerning the family structure, parental educational status and employment, it emerged from the discussions that quite a few of the mothers in the group were employed. Almost all families had three children, aged between 2 years – 12 years. Most of the families were from Middle Eastern countries such as Iraq, Iran, Syria and Lebanon. During the initial meetings, children were present together with their fathers and mothers. Eventually only the mothers participated regularly together with their children. There were 8-12 mothers during each of these 9

sessions and about 15 children during each meeting (See Figure 1). Each meeting lasted for about two hours with 15 minutes break after the first hour.

Please include figure 1 about here

Aside from the participants and academic partners, the research team included representatives from the public and private sectors as well as non-profit organizations affiliated to the project such as the Primary care, Pharmacy, Save the Children and TePe Oral Hygiene Products. Not all actors were however present in all meetings; their presence was determined by the theme discussed on the different occasions. The presence of a private company among the actors involved in the project may raise questions related to conflict of interest. However, the relationship between the private company and the research project was mediated by the mutual goal of creating of social value for disadvantaged populations. Through their presence in the project, the company aimed at understanding user needs in order to develop products and solutions for improved oral health in socioeconomically distressed communities. The company had no financial gains through their participation in the research project. The head of their odontology and scientific affairs section was the primary representative of the company in the project. Additionally, the representative is also a specialist in pediatric dentistry, which made her presence useful since she could share her valuable knowledge, and experiences with the research team as well as participants. Previous studies have also considered academic-private partnerships in health research as an advantage rather than a limitation, because through such partnership emerges innovative strategies and positive effects which helps achieve higher public health goals [48, 49].

Patient and Public Involvement

The CBPR approach not only promotes involvement of the citizens of the community, but also relevant representatives of public and private organizations together with academic

researchers in power-balanced environment while working to identify and implement contextually relevant health promotional activities to promote behavioral change.

Design

The current study is a participative action research study with a qualitative approach where multistage focus group interviews were the mode of data collection. Multistage focus groups are characterized by the same group of persons exploring different themes during several meetings [50]. This method was inspired by Paul Freire's culture circles where the aim is to foster a participatory experience with an emphasis on dialogue and reflective action in response to an emancipatory health education [51]**.** The power relations are balanced within the circle, where one-person facilitates the discussions and debates by initiating the process. The facilitator then leaves it to the group to take responsibility for the progress in the inquiry process through self-reflections and sharing individual knowledge and experiences with each other. The dialogues help elevate the participants' experiences to a higher level of abstraction. The focus groups deduce individual learning, as well as collective ways of thinking through reflection and dialogue within the group. During each meeting, the participants try to identify a common problem in the community, explore the problem further to identify resources and solutions while simultaneously implementing them to bring about transformation [51, 52]. **A**s a first step in this process, the participants gained knowledge from experts like dieticians, nurses or dentists, in the form of a dialogue exchange**.** Some examples of the topics selected by the participants include discussions on sugar content in their routine diet and possible healthy alternatives to it (with a dietician). Pediatric nurses provided information regarding psychosocial support for behavioral change. The dental experts in this study were present during all occasions and added knowledge concerning oral hygiene, fluoride and the role of diet in relation to oral health.

Data Collection

Preliminary meeting

The families who agreed to participate met at nine different occasions once in two weeks over a period of six months beginning in September 2018. The first step in the multistage focus groups was to understand the participants' perceptions on oral health. Prior to the initiation of the actual activity sessions, the research team used a participatory research approach photovoice, to assess the complex phenomenon of diet from a sociocultural perspective among children. In this method, photography was used as a tool to understand the factors surrounding the actual problem in consideration, from within the context of the participants. This is also a form of qualitative research where the photos act, as a focal point to initiate discussion and promote better understanding of participants needs. This method helps overcome language and communication barriers and enhances discussions within the group [53, 54].

The children were requested to bring pictures of healthy and unhealthy food and discussions were initiated based on their photos. In addition, they were also asked to take pictures of their toothbrush, as a base for discussing oral hygiene habits. The children sent the photographs via WhatsApp to the health promoter a few days prior to the scheduled introductory meeting. Photographs sent by the children were compiled, printed and later presented to the children for review together with the rest of the group. One of the team members initiated the discussion with the children using the pictures they sent and led the discussions.

Actions points from the preliminary meeting

Through the discussions during the preliminary meeting, it emerged that the children consumed a high amount of sugar as part of their daily diet. The children also expressed a

dislike for the lunch served at school. It came to be known that most of the children did not eat breakfast owing to time constraints, family situation and cultural aspects. Through discussions with parents, it was understood that they had limited control over their children's dietary choices. Regarding oral health and oral hygiene children frequently visited the dentist when they suffered pain, some had fillings and a few even had teeth extracted in early childhood. Concerning oral hygiene, there was a lack of awareness of fluoride use and its importance for oral health among children. It appeared that despite suffering tooth decay they were not informed about the role of fluorides in caries prevention. The session was followed by a debriefing and discussion with parents to understand their concerns about oral health of their children and the families in general. It emerged that parents were not satisfied with the tooth brushing carried out e by their children. The children did not permit parents to help them with brushing despite being advised by the dentist or dental hygienist. In conclusion, parents felt the need for dietary advice focusing on the different meals, breakfast, lunch and dinner. In addition, they also wanted to gain more knowledge on oral hygiene habits. They preferred all sessions to be in the presence of the children since they would follow the advice of others better than they would do if the parents told them the same thing.

In the consecutive occasions, dialogue-based teachings or reflective dialogues were facilitated by experts in the related fields to address different challenges that emerged in the first meeting. Behavioral change in children through educating parents was also driven by the reflective dialogues. Previous studies [55] state that reflective dialogue-parental education is an effective method to enhance parental awareness and improve parenting skills. This is achieved through confidence building, which is promoted, by social support and peer influence. The discussions in the group were predominantly held in Swedish and interpreted in Arabic by the health promoter for the benefit of some parents who could not speak Swedish. At the beginning of every meeting, families had the opportunity to provide feedback

from the previous session. They also discussed their ability to make changes inspired by what was learnt from their participation and the challenges faced in doing so. All discussions were audiotaped with the consent of the families. A member of the researcher team also acted as an observer and was responsible for taking notes during each meeting.

Data Analysis

One team member [RR] reviewed audio recordings repeatedly to develop a content log of the discussions as well as summary. Listening to the recordings, several times facilitated rapid identification of codes together with the help of the observational notes. Two other members from the research team who were not involved in the data assimilation process listened to the recordings to complement the preliminary analysis performed by the first researcher [EC, MR]. Following this, the researchers discussed and reflected on their findings together and came to consensus over a final list of codes which were finally confirmed by [SBR]. The discussed codes were placed under categories and each category was further defined in detail to identify overarching themes. While data extraction was done using rapid identification of themes from audio recordings (RITA) method, qualitative content analysis with an inductive approach [56], was used to identify themes relevant to the research goals. The RITA method has previously been established as a method that yields prompt and detail results from qualitative data while also being less time consuming and less labor intensive [57-59].

Qualitative Rigor

Results from qualitative studies are evaluated based on certain criteria such following Guba and Lincoln's criteria [60] as factors that predict the authenticity of the results. According to these criteria, the quality of results depends on the methods of data collection and the

technique of data interpretation. The current study is built on the CBPR principles of co-learning and sharing thereby holding the contact between the researcher and community member's closer; thus, enabling better understanding and interpretation of information provided. Furthermore, the involvement of the health promoter at the different stages of the research process ensured open communication. This provided an opportunity for the participants to share trustworthy accounts of experiences to other members in the group ensuring credibility. The research team made observational notes describing the context to support the audiotaped data, which contributed to transferability of the findings. Dependability was attained by involving a third researcher who was not involved in the initial data collection and analysis to review the coded data. To achieve confirmability, the third member from the research team rechecked audio recordings and the observational notes in iterations. Findings were shared with participants and reconfirmed when necessary. Issues related to reflexivity was address using constant communication with the participants after each meeting, through peer debriefing, as well as triangulation by including several members in the research team in the focus groups as well as analysis of audio recordings. Self-reflexivity or personal reflexivity of the members of research team was considered rather positive since it gave the possibility for the team to reflect on power and privilege issues in relation to the context. This is also in line with guidelines indicated by prior work in participatory research [61].

Ethical Considerations

The Regional Ethical Review Board in Lund approved the study (DNR 2016/824). All participation was voluntary, and the participants were informed that they could leave the discussions at any time without any explanation or consequences. The parents received detailed information regarding the purpose and nature of the study, and were requested to

provide written informed consent before enrollment. Parents were requested to consent their own as well as their children's participation. All invited participants consented both their own participation as well as that of their children. The children also gave a verbal consent. Participants were ensured confidentiality at the time of data collection. In addition, participants were also informed that all results were to be presented abstracted and presented at a group level and no individual shall be identifiable through their expressions in neither reports nor scientific articles that emerge from this study. This information was explained verbally, as well as, included in the information letter that they received when they signed the informed consent. Considering the nature and design of the multistage focus group, it may be difficult to ascertain confidentiality however, the research team explained to the mothers concerning this and requested them to refrain from discussing sensitive or personal opinions shared in the group elsewhere.

Findings

Three main themes including meaningful social interactions, family dynamics, and health trajectories were identified on exploring reflective thoughts and discussions in the focus groups with an aim to understand the process of changed behavior within the group.

Meaningful social interactions

The mothers reported in the beginning that they agreed to participate in this study since they trusted the health promoter. However, after a few meetings they began to enjoy the social aspects of being with new people especially since they would otherwise sit idly at home.

"In the beginning I came here because we knew the "health promoter". After coming here a few times, we started to interact with the others in the group. Now we do activities outside of this group, for example we go out on picnics or barbeque together. Coming here and meeting people is definitely better than sitting idle." (Mother of child aged 9 years, Meeting 8)

Although the mothers enjoyed the social aspects during the initial meetings, they began to look forward to interactions that were more purposeful and considered gaining knowledge as primary focus.

"It is not just for meeting others. It is good that I get information about healthy food and what a good breakfast is for both my children and me. I just do not go there every time to meet someone else. We can do that in a different way." (Mother of children aged 2-11 years, Meeting 8)

The mothers in the group believed that the discussions and information they received were better than what they had received from the nurses at the primary care. They highlighted the importance of being in a group in the learning process since the discussions were interactive and not controlled or determined by the facilitators or field experts

"When we meet a nurse at a primary care center, they sound tired and disinterested and hence do not provide the same information we get here. It was not of good quality neither educational nor motivating as we do here within the group." (Mother of children aged 6-10 years, Meeting 6)

The mothers felt that they were given not only the opportunity to gain new knowledge and learn, but also the possibility to discuss and share their own knowledge and experiences. They also gave and received tips from each other within the group.

"It was not just a lecture, we got to ask, discuss and learn from the experts and from each other. It was fun to give tips and suggestions to each other based on our experiences." (Mother of children aged 2-11 years, Meeting 7)

Some of the mothers were unsure from the beginning if they could make changes to their diet. After participation for a few weeks, they felt motivated and gradually started to make changes.

"In the beginning I was drinking 5-6 liters of juice a day, after being here I have reduced it to 1 liter per week. I initially thought that I can't but when I was told about the sugar content of the juice and learnt about others changing their dietary patterns, I too decided to change." (Mother of children aged 6-12 years, Meeting 7)

Towards the end of the sessions, several mothers expressed their interest in communicating the knowledge they gained to the rest of the community, as they believed that the information was important. They even went a step further and mentioned that they would like to join the research team in the future to support the mission to improve oral health among the population in the neighborhood.

"I want to be one among your team, you are few and there are many people who need help so I want to help others as you do." (Mother of children aged 2-11 years, Meeting 8)

Children in the group were also interested in spreading their knowledge to their friends and classmates. One of the children in the group had already begun speaking about sugar intake and oral health to his class.

"I told my classmates about why eating sugary things is harmful and how sugar affects the teeth. My teacher was impressed with me and wanted me to share more information in the class after each meeting." (Child 11 years, Meeting 6)

Family dynamics

The role of individual members in the family, bonding and interactions between family members together with socio-cultural or traditional values carried within the family, influence lifestyle and behavior of the children. Acculturation and migration also have an influence on the relationship between children and parents, specifically mothers. Thus, a sustainable change in diet of children is influenced by family dynamics.

Mothers in this study perceived that they had important responsibilities but were merely limited to executing actions with little influence on decision-making. This was considered as direct challenge in promoting dietary changes in the family.

"I am a woman I can decide only for myself, I cannot tell my husband what he has to eat. My children eat what their father eats. I drink a lot of tea and my children drink tea too. It is our tradition." (Mother of children aged 3-14 years, Meeting 2)

Children in the families acknowledged their traditional practices and consumed high amount of sugar as part of it. They believed that following parent's action was also associated with culture.

"We drink tea as a family in the evenings and during weekend. I cannot drink tea without sugar in it. I usually put four teaspoons of sugar in my tea. That is how my parents drink too. It is a cultural thing." (Child aged 9 years, Meeting 1)

From the discussions with the children, it emerged that they were often alone when they ate breakfast so they ate whatever they found in their refrigerators.

"I eat breakfast alone and I eat whatever is available in the refrigerator. I mostly eat bread with Nutella, as it is easy to make. My mother goes to work and my father is still sleeping then. My brother never helps me even if I ask." (Child aged 8 years, Meeting 3)

Some mothers believed they could not provide enough attention to their children's diet due to lack of time and a stressful life in Sweden. Mothers also believed that fathers could not help children, as well as, the mothers as men have low involvement in the upbringing of children. After participation in the activities, the mothers found a solution to this through the tips they got from fellow participants.

"I leave early to work and my children eat breakfast by themselves. My husband cannot prepare food and take care of the children, sometimes he forgets everything, he miss to put on their wooly caps in winter. It is cultural" (Mother of children aged 6-10 years, Meeting 2)

Mothers valued the involvement of children in the activities since they recognized changes in children's behavior at home after participation. Children were more cautious about their diet and sought their parents´ help while brushing their teeth, which they refused to do previously.

"The good thing is that we got to be here with our children, and that they also got to listen and learn. They have become more responsible at home; my son does not want to eat as many bananas as he did earlier because he has learned that it has more sugar. He wants me to help him brush his teeth; he would never allow me to do it before even if I insisted. "(Mother of children aged 2-11 years, Meeting 5)

Mothers were initially unsure about influencing the diet and lifestyle of their spouses, but when they made changes for themselves their husbands chose to do so too. In some households, women brought home information material from the meetings to convince their husbands.

"At first I thought it might be hard for me to influence my husband, but when I changed my own diet he chose to change his too," (Mother of children aged 2-11 years, Meeting 8)

"When I told him about sugar content in each food and showed the sugar brochure my husband was shocked and immediately decided to change."(Mother of child aged 11 years, Meeting 8)

Health trajectories

When the mothers initially volunteered to participate in the activity and attended the meetings, they were concerned about their children's oral health behavior and diet. From the initial discussions with parents and children it emerged that children frequently consumed sugar in form of candies, juices and tea with sugar, which was a part of their tradition. Parents were also worried since children frequently complained of toothache and some of them had several fillings or a lost tooth.

Some parents even believed that they needed some amount of added sugar for normal body function. Parents were unable to monitor and control their children's' sugar intake.

"I must have juice in the refrigerator all the time because my children want to drink juice once every hour. I cannot say no to them because they will not eat anything else. I can't help but buy juice as I also like it." (Mother of children aged 6-12 years, Meeting 1)

After participation in the activities, mothers reported a sense of satisfaction and relief since they were able to take control over their situation and bring about change, promoting a healthier lifestyle for their children. This in turn made them happier and they slept better.

"I felt bad when I realized that it was me who bought juice and sweets. I understood that if I stop buying things it would help my family. Since I did that, I sleep better because I know I have provided healthy food to my children." (Mother of children aged 6-12 years, Meeting 8)

Children in the group were particularly excited about learning to brush their teeth from experts and the use of different kind of toothbrushes. They also spoke about the relationship between healthy teeth and healthy living after participation in the discussions.

"It was fun to see all the different brushes. I never knew there existed so many. I learnt to brush my teeth. I think that we must brush our teeth well since it makes us feel healthy." (Child aged 8 years, Meeting 7)

Mothers began to understand the influence of diet on their health more distinctly after participation in the activities. Mothers reported change in self-perceived health owing to behavioral change after participation in the activities.

"Since I made changes to my diet, I started feeling fresher and healthier. I was at the doctor last week and he was surprised because I have lost weight." (Mother of child aged 9 years, Meeting 8)

Participants began to understand the connection between oral health and general health and well-being after having participated in the activities.

"Through participation in this activity I have learned about the connection between oral health with general health. I have actually seen a change in my physical health." (Mother of children aged 2-11 years, Meeting 8)

Discussion

Participation in the health promotional activities led to changed oral health related behaviour, and appeared to empower mothers and children, to gain control over their health, which in turn extended into the entire family as illustrated in the main findings social interactions, family dynamics and health trajectories. The analysis also draws on Zimmerman's (1995) definition of psychological empowerment, which includes the dimensions of people's perceived control of their lives related to their level of participation in community change [62].

The current study shows that a participatory dialogue and reflection, targeting behavioral change considering the actual needs of the community may initiate lifestyle changes among socially disadvantaged immigrant families compared to mere personal dietary counselling in primary care centers or at the dental clinics. This is in line with a previous study [63] which shows that dietary counselling offered by health care workers is frequently inconsistent, unclear - and beyond all - not culturally tailored and hence not effective in promoting dietary changes. On the other hand, in participatory research, participants are engaged in a collaborative process of social transformation, which enhances the possible uptake of knowledge through reflection within a social circle [64]. The role of mothers as important channels for behavioral change in the families is in line with a previous study based on oral health educational interventions involving immigrant families with children living in Australia [65]. However, the intervention offered in the Australian study was a predetermined intervention, unlike in the case of this study were the participants determined the health promotional activities. In addition, the health promotional activities in the current study was implemented over a longer period with frequent visits and involved children aged 7-14 years in contrary to the Australian study were the intervention was provided for 3-4 weeks and children of younger age (1-3 years) were included. Involving older children in the discussions

offered an additional benefit, as they were also active during the sessions, had the opportunity to ask questions, learn from experts, and thereby made changes in their lifestyle.

The interaction between individuals in a group appeared to exert a strong influence on the behaviors, which was beyond the mere social aspect of meeting people to break isolation. The process involved utilization of collective knowledge to bring about changes in daily life through mutual sharing and motivating each other. These results are in line with discussions in a review study [66] that shows that participation in interactive lifestyle interventions in small groups better promotes behavioral and lifestyle changes. This is because individuals in a group are often in similar situations and through being role models to each other even the harder to convince participants in the group tend to change [66]. Similarly, according to an earlier study , social interaction between children is known to help in shaping their cognition, altering their attitudes, beliefs as well as understanding of reality that in turn promotes behavioral changes [67].

The finding from the current study are in line with a previous study which describes the process of change in parental conception following reflective dialogues which facilitated behavioral changes in four stages including awareness of one's current conception, dissatisfaction with one's current conceptions, support and understanding from others, exposure to alternate ways, opportunities for encouragement and reflection [55]. According to Freirean principles which states that the consequence of offering knowledge via dialogue as a tool enhances individuals control over self and their beliefs thereby leading to self-empowerment [68] and such an empowerment may result in behavioral change [69]. These principles were exemplified in the current study where the mothers in the group became conscious and aware of what constituted the meals they served their families through reflecting on the images of their own breakfast during the initial meeting. Further, through participation in the group meetings they realized that they had a significant role in promoting

healthier diet to the rest of their family. Despite being frustrated in the beginning, they eventually found support from other participants in the group who were in similar situations. The support, understanding, mutual respect and caring shared among each other in the group tended to have made the mothers psychologically stronger to accept the fact that their families did not consume healthy diets. They began welcoming alternative conceptions that they were exposed to both from the different actors providing knowledge as well as through interaction with other members in the group with varying perceptions. Over time, the participants progressed from a stage of seeking knowledge to sharing knowledge through providing tips to one and another as well as to their friends and relatives in the community. The mothers expressed a feeling of confidence in self and appeared to be empowered after participation, which they were lacking in the beginning of the study when they really felt powerless due to their inability to take control over their children's oral health related lifestyle.

Practical Implications

It became known through this study that brochures and health education material used in the Swedish health care were adapted to the Swedish context and were considered less useful for needy communities. The participants believed that educational material showing sugar content in various food products would help understand sugar intake among families in socially disadvantaged neighborhoods. As a part of the activities, participants learnt to read and understand the ingredients list printed on the package of different food products. They also learnt to convert the quantity of sugar in grams to sugar cubes, which helped them communicate and spread the knowledge they gained. Participants gathered photographs of food products and some culturally specific dishes which they wanted to include in a new brochure. Together with the actors in the research team and a dietician, the participants

developed a sugar brochure. The sugar brochures were printed in multiple copies by TePe and distributed to the participants. The brochure was also shared with the primary care, dental care and pharmacy for further dispersal of the material. The participants, both mothers and children found the brochure as a concrete tool for informing their family and friends in the community about the harmful effects of sugar consumption. The mothers in the group became oral health ambassadors in the community and started an initiative "Fight against sugar intake". They organized small gatherings with other women in the community to talk about the knowledge they gained from their participation in this study, together with the help of the brochure. Some of the children in the group who expressed interest to learn more about oral health, diet and healthy lifestyle were specially educated by experts from TePe over a period of one month with one lecture a week. After participation in the educational sessions, the children were certified as child oral health ambassadors. These child oral health ambassadors began spreading their knowledge in their respective schools.

Limitations

The current study could have been complemented with a quantitative assessment to explore changes in oral health related behaviours after participation in the activities. Such an evaluation is planned with this group using a participatory approach where health promoters will have an active role in distributing health surveys and analyzing them together with researchers.

Another potential limitation in this study is the non-participation of fathers, which may have introduced a selection bias. This however does not undermine the value of the findings from this study. Fathers in this study decided not to participate in the activities since mothers had the primary role of raising children and steering their behavior in these communities. This is

also in line with prior research on family traditions and significant role of mothers in raising children [70, 71]. A notable feature in multistage focus groups used in the current study is that participant dynamics may change during subsequent meetings in that new families take part or some of the original families do not take part in some of the meeting series. According to previous studies, the introduction of new members have a positive effect in that new discussions that emerge and more knowledge is generated [51]. However, in the current study it must be noted that eight to twelve families attended almost all meetings while there were also few new families in every occasion, which steered new discussions and new perspectives that benefitted even those families who came regularly.

The rapid identification of themes from audio recordings may be considered a methodological limitation. However, in contrast to the original method of listening to the audio for three minutes [57], the themes were identified after listening to the entire audio recording several times. In addition, extensive field notes were collected during each of the nine sessions, which was used as complementary information to the audio recordings during analysis. Aside of this the research team also had a deeper understanding of the participants views from a contextual perspective owing to their prior engagement with participants in the trust-building phase, which was also enhanced by the involvement of health promoter.

Conclusion

The current study highlights the importance of working with the family, to ensure sustainable lifestyle changes. Placing the focus on both the process of change as well as the action paved ways to explore how families experienced their participation in the activities offered as well the determinants of behavioral change. Providing mothers and children with the knowledge

and skills to promote oral health behaviors influences not only their immediate family but also their communities or social groups. However, the success of knowledge transfer is mediated by the principles of participatory research that strengthens and appeared to empower individuals, and may contribute to a healthier society and reduced health disparities.

Reflective dialogue and interactions within the social context influences the health promotion process, and through the participatory approach, individuals seem to gain empowerment that in turn can lead to behavioral change. Such a strategy can be considered in future work targeting to promote health in disadvantaged populations.

Conflicts of interest

The authors declare no financial, personal or other conflicts of interest.

Availability of data and materials

The audio recordings analyzed during the current study are not publicly available due copyrights issues and GDPR regulations but are available from the corresponding author on reasonable request.

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Authors' Contributions

RR, EC, SBR, ANF, AK and MR conceptualised and designed the study. RR, SBR, ANF and MR collected data. RR, EC, MR and SBR analysed the audio recordings. RR wrote the initial version of the manuscript under the guidance of AK, EC and MR. All authors gave detailed feedback on early iterations of the manuscript. All authors have read and approved the final version of the manuscript.

Data Sharing Statement

The audio recordings from the focus groups generated and analyzed during the current study are not publicly available due institutional policy and GDPR regulations but are available from the corresponding author on reasonable request.

Legend of Figure 1

Chronological timeline of the multistage focus group interviews.

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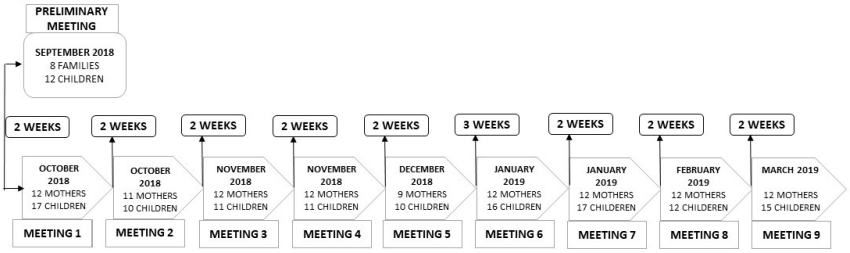

Figure 1:Chronological timeline of the multistage focus group interviews

338x190mm (96 x 96 DPI)

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		Reporting Item	Page Number
Title			
	#1	Concise description of the nature and topic of the study identifying the study as qualitative or indicating the approach (e.g. ethnography, grounded theory) or data collection methods (e.g. interview, focus group) is recommended	1
Abstract			
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Purpose or research question	#4	Purpose of the study and specific objectives or questions	8
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Qualitative approach and research paradigm	#5	Qualitative approach (e.g. ethnography, grounded theory, case study, phenomenolgy, narrative research) and guiding theory if appropriate; identifying the research paradigm (e.g. postpositivist, constructivist / interpretivist) is also recommended; rationale. The rationale should briefly discuss the justification for choosing that theory, approach, method or technique rather than other options available; the assumptions and limitations implicit in those choices and how those choices influence study conclusions and transferability. As appropriate the rationale for several items might be discussed together.	11
Researcher characteristics and reflexivity	#6	Researchers' characteristics that may influence the research, including personal attributes, qualifications / experience, relationship with participants, assumptions and / or presuppositions; potential or actual interaction between researchers' characteristics and the research questions, approach, methods, results and / or transferability	15
Context	#7	Setting / site and salient contextual factors; rationale	9
Sampling strategy	#8	How and why research participants, documents, or events were selected; criteria for deciding when no further sampling was necessary (e.g. sampling saturation); rationale	9-10
Ethical issues pertaining to human subjects	#9	Documentation of approval by an appropriate ethics review board and participant consent, or explanation for lack thereof; other confidentiality and data security issues	15-16
Data collection methods	#10	Types of data collected; details of data collection procedures including (as appropriate) start and stop dates of data collection and analysis, iterative process, triangulation of sources / methods, and modification of	12

		procedures in response to evolving study findings; rationale	
Data collection instruments and technologies	#11	Description of instruments (e.g. interview guides, questionnaires) and devices (e.g. audio recorders) used for data collection; if / how the instruments(s) changed over the course of the study	12
Units of study	#12	Number and relevant characteristics of participants, documents, or events included in the study; level of participation (could be reported in results)	10-11
Data processing	#13	Methods for processing data prior to and during analysis, including transcription, data entry, data management and security, verification of data integrity, data coding, and anonymisation / deidentification of excerpts	14
Data analysis	#14	Process by which inferences, themes, etc. were identified and developed, including the researchers involved in data analysis; usually references a specific paradigm or approach; rationale	14
Techniques to enhance trustworthiness	#15	Techniques to enhance trustworthiness and credibility of data analysis (e.g. member checking, audit trail, triangulation); rationale	15
Results/findings			
Syntheses and interpretation	#16	Main findings (e.g. interpretations, inferences, and themes); might include development of a theory or model, or integration with prior research or theory	17-22
Links to empirical data	#17	Evidence (e.g. quotes, field notes, text excerpts, photographs) to substantiate analytic findings	17-22
Discussion			
Intergration with prior work, implications, transferability and contribution(s) to the field	#18	Short summary of main findings; explanation of how findings and conclusions connect to, support, elaborate on, or challenge conclusions of earlier scholarship; discussion of scope of application / generalizability; identification of unique contributions(s) to scholarship in a discipline or field	23-25

Limitations	#19	Trustworthiness and limitations of findings	26-27
Other			
Conflicts of interest	#20	Potential sources of influence of perceived influence on study conduct and conclusions; how these were managed	28
Funding	#21	Sources of funding and other support; role of funders in data collection, interpretation and reporting	29

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Understanding behavioral changes through community based participatory research to promote oral health in socially disadvantaged neighborhoods in Southern Sweden

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Understanding behavioral changes through community based participatory research to promote oral health in socially disadvantaged neighborhoods in Southern Sweden

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Abstract

Objectives: Inequalities in oral health have been on the rise globally. In Sweden, these differences exist not between regions, but among subgroups living in vulnerable situations. This study aims at understanding behavioral change after taking part in participatory oral health promotional activity among families living in socially disadvantaged neighborhoods in Southern Sweden.

Setting: The current study involved citizens from a socially disadvantaged neighborhood in Malmö, together with actors from the academic, public and private sectors. These neighborhoods were characterized by high rates of unemployment, crime, low education levels and most importantly poor health.

Participants: Families with children aged 7–14 years, from the neighborhood were invited to participate in the health promotional activities by a community representative, known as a health promoter, using snowball sampling. Between 8-12 families participated in the multistage focus groups over six months. Data were analyzed using qualitative content analysis.

Results: Three main themes emerged from the analysis, providing an understanding of the determinants for behavioral change, including meaningful social interactions, family dynamics, and health trajectories. The mothers in the study valued the social aspects of their participation; however, they believed that gaining knowledge in combination with social interaction, made their presence also meaningful. Further, the participants recognized the role of family dynamics primarily the interactions within the family, family structure and traditional practices as influencing oral health related behavior among children. Participants reported having experienced a change in general health owing to changed behaviour. They started to understand the association between general health and oral health that further motivated them to follow healthier behavioral routines.

Conclusions: The results from this study show that oral health promotion through reflection and dialogue with the communities, together with other stakeholders may have the potential to influence behavioral change and empower participants to be future ambassadors for change.

Strengths and limitations of this study

- Involvement of community members in the development health of promotional activities.
- Working with both parents and children together to promote oral health.
- Triggering knowledge mobilization through reflection and dialogue.
- Partnership between community members and different stakeholders facilitated by health promoters.
- Non- participation of fathers may have been a potential source of selection bias.

Introduction

There has been an overall improvement in oral health of the Swedish population in the past decades owing to the advancements in public dental services and state financed insurance policies [1, 2]. However, large discrepancies in oral health do exist [1, 3-7]. The level of inequalities are not substantially different between regions in Sweden but rather between small areas within the major cities, where there is a concentration of subgroups in marginal or vulnerable situations [3]. These socially deprived groups frequently include heterogeneous populations who differ by their ethnicity, migration status, historical background, culture, and practices related to health, in comparison to the majority population [8]. Oral health disparities have been on the rise owing to challenges such as lack of knowledge and poor social policies, unavailability of context-based information, and most importantly the disconnection between oral and general health [9]. This disconnection is a result of the current dental care system globally, as well as in Sweden, considering merely individual behavioral risk factors while addressing oral health problems. However, socio-cultural as well as policy related aspects are key determinants of not only oral health but also general health and well-being. Health care providers tend to look at diseases in isolation rather than employing a collaborative approach to address health from a broader perspective. Thus widening the gap between oral and general health and increasing the burden of disease among socio-culturally different and disadvantaged subgroups of the population [10-13]

Since the early part of the twentieth century, there has been a global drive in reducing health inequalities [14, 15]. Health inequalities in general are associated with various social determinants including living conditions, employment status, childhood conditions as well as aging [16]. These determinants also apply to oral health disparities. Moreover, oral diseases also share risk factors with other non-communicable diseases and are associated with

cardiovascular disorders and diabetes [17-22]. According to the World Health Organization (WHO), oral health is an integral part of general health and is fundamental to overall well-being and quality of life. Thus, addressing oral health disparities is an inevitable part in health promotional activities aiming to reduce health disparities [23]. Oral health impairments have a considerable impact on the quality of life of affected individuals both functionally and esthetically [24-26].

Poor oral hygiene and excessive or frequent intake of sugar between meals are leading causes for caries and poor oral health in general [27]. The consumption of fermentable carbohydrates containing added sugars have been on the rise, particularly among children and young adults [28]. High consumption of fermentable carbohydrates provokes bacterial action leading to the demineralization of tooth enamel, that might lead to the development of caries [29]. The WHO recommends limiting free sugar intake and replacing it by increasing the consumption of fresh fruits and vegetables, nuts, seeds and wholegrain starch-rich foods, together with practising good oral hygiene as measures to prevent dental caries, periodontal disease and promote oral health. Tooth brushing with fluoridated toothpaste in combination with a well-balanced diet is the foundation for good oral health [28, 30, 31].

Dental caries is one of the most common preventable disease in children globally [23, 32, 33]. Cariological risk assessment among younger children is important as caries in early childhood progresses more rapidly since the enamel is thinner in the primary teeth than in the permanent teeth. Caries incidence in preschool age increases the risk of caries in adolescence and later in life [34]. Moreover, caries impairs the quality of life of children by disrupting vital everyday functions [2]. Children with dental caries tend to have poor self-image and self-esteem [21, 23, 35]. Furthermore, caries may lead to adverse effects including reduced social interaction, pain, discomfort, disturbances in the development of occlusion, stress and depression [32]. According to previous studies, Dental caries was has been shown to be twice as common

among non-Swedish children and adolescents belonging to socioeconomically distressed families compared to their Swedish counterparts [1, 3-7]. Determinants for dental caries in immigrant children include parents' education level and ability to assimilate to Swedish dietary conditions since they are not often similar to the dietary patterns of immigrant families [3]. Parents in a socially vulnerable environment may need community support to establish good dietary and oral hygiene habits, including using fluoride, as part of caries prevention. In vulnerable areas, oral health problems may be part of a number of different social problems and a number of actors in the community, such as maternal care, child health care, and pharmacies may need to make joint efforts to provide health interventions for families with different cultural backgrounds [5-7].

The Swedish dental care system has a strong tradition of preventive dental care in children and adolescents. Since the 1960s, there has been a steady decrease in caries prevalence among children owing to the effective and timely preventive measures implemented by the Swedish dental care system. Despite these efforts, caries prevalence is considerably higher among selected subgroups of the Swedish population who are more often from socially disadvantaged backgrounds. Studies based on Eurobarometer surveys have identified that socially disadvantaged populations frequently lack knowledge on self-care, including practice of good oral hygiene, diet and use of fluorides [36]. This is especially true concerning children in disadvantaged communities who experience more caries than their Swedish peers. Swedish dental care including preventive measures and treatment are provided free until the age of 23. Nevertheless, these efforts have been insufficient in providing dental care without disparities. Children from socially disadvantaged settings are less regularly attending these visits. There has been a lower level of utilization of dental care despite the increased need among socially disadvantaged migrant groups [1, 3, 4]. Oral health behaviors are mediated to children through their parents with the support of the regional dental care [3, 4]. Often

immigrant parents are unaware of the support services that are available due to recognized practical barriers such as language difficulties and health literacy. Parents also have different expectations from the health care system, which are based on their experiences from their own home country [37, 38].

Most of the information available in the Swedish dental care is evidence-based, but lacking contextual adaption. Traditional values and family practices influences the attitude towards health and how communities value oral health as well as what is considered as a standard for good health [3, 4, 37]. An understanding of specific populations, their socio-economic position, the influence of their traditional practices and above all the influence of all of these factors on their health behavior is necessary to improve utilization of dental care in socially disadvantaged groups. This will in turn contribute to reduced oral health disparities [3, 4, 6, 9]

There is an acute need for appropriate interventions and services to effectively address the oral health disparities of the underserved. These interventions must be culture and context sensitive novel oral health promoting solutions and not merely based on the views of the concerned, but rather influenced by the active participation of the populations in need [39]. Active participation by representatives from the target groups is crucial for reducing the gap in knowledge as well as tackling and allocating resources that support specific community needs [40].

Community based participatory research (CBPR) is one such a method, which focuses on addressing the determinants of health from a social as well as environmental perspective through active engagement of the community members and other concerned actors throughout the research process [40]. Taking into account specific social requirements and increasing community engagement to improve health, CBPR has emerged as an alternative paradigm for health and social research [39, 40]. CBPR is considered a significant part of translational

research, which helps to improve the health of specific communities, eliminate inequality and achieve equality in health through community empowerment [41]. The principles of CBPR are based on core concepts including, partnership and co-learning, capacity building or training community members to become future health ambassadors, knowledge production for societal transformation and prolonged commitment which facilitates achieving higher level goals like reducing disparities [39]. CBPR is a systematic effort to integrate active participation by the community in the process of decision making by creating a mutual understanding of local phenomena and practices specific to the community which contributes to the development of innovative strategies to promote social change [40]. Empowerment has been considered critical in the CBPR process although the phenomenon was not frequently explored while evaluating CBPR based health promotional activities. Empowerment is defined as the ability to control one's own life especially in relation to own health and well-being [42]. Studies addressing oral health disparities focusing on diet and oral hygiene using the CBPR approach involving multiple actors from the community, public sector, private sector as well as non-profit organizations are sparse.

The current study was part of a larger project Health Promoting Innovation in Collaboration. The aims of the main project were to develop and study health-promoting activities based on participatory research methods. Focus group interviews based on CBPR principles were conducted with residents in a socially disadvantaged neighborhood in 2016. The interviews aimed at identifying measures to improve health among the residents. During the discussions, the citizens in the neighborhood identified several problem areas where they needed help, including poor oral health, lack of access to physical activity, poor mental health, and lack of knowledge concerning health and healthy behaviors.

Health promotional activities were held as part of the larger project focusing on the challenges identified by the community members. The health promotional activities targeted behavioral

change through knowledge mobilization using a participatory design focusing on key factors such as empowerment [40]. Knowledge mobilization is a process where reciprocal and complementary knowledge is shared between multiple actors, to promote multidirectional co-construction of knowledge. The basis for knowledge mobilization is interactions that create knowledge and reflections during and after the interactions that facilitate sense-making of the acquired knowledge [40]. Community members participated in all stages of the project including planning, implementation and evaluation. Representatives from the neighborhood, known as health promoters, were integral in coordinating the activities in the different workshops. In an international context, they are known as culture brokers, and their role has been proven promising in participatory research driven initiatives [43, 44]. However, the health promoters working in this project had a unique role since they were educated in participatory research methods. These health promoters were instrumental in identifying and recruiting participants, assisting with language interpretation and most importantly to inform the research team about the cultural nuances of the community.

As members of the community, they also had deep knowledge and experience of the common problems faced by these communities particularly in relation to access to health care [43].

Oral health was one of the challenge areas identified by the community and addressed among the activities initiated as a part of the larger project. This was considered a priority area since dental caries was on the rise in families with young children. The initiatives focused on oral hygiene, the role of fluoride as well as diet since the residents also perceived a lack of access to personal advice on diet and health in their area.

The aim of the current study was to explore the behavioral change initiated by a participatory community based health promotion targeting oral health in children and parents living in a socially disadvantaged neighborhood in Southern Sweden.

Method

Context

The current study was based in a socially distressed neighborhood located in Malmö city in Southern Sweden. The majority of the population living in this neighborhood are non-Swedish speaking. According to a report from the Swedish Intelligence Unit, this neighborhood has been considered one of the fifteen most vulnerable localities in the country [45]. The report also highlights challenges like high rates of unemployment, crime, low education levels and poor health among residents which was also supported by prior research concerning high incidence of risky health behaviors among citizens in this neighborhood [46, 47].

Participants and Actors

The health promoter involved with the oral health related activities sent information about the activities two weeks ahead of the first meeting and invited families with children between 7-14 years to participate in the meetings. Initially a few families identified by the health promoter volunteered to participate during the first session. More participants were later recruited through purposeful snowball sampling, mainly through spreading information through word of mouth. A total of 12 families were regularly involved in the activities. Although no specific demographic information was collected from the parents concerning the family structure, parental educational status and employment, it emerged from the discussions that quite a few of the mothers in the group were employed. Almost all families had three children, aged between 2 years – 12 years. Most of the families were from Middle Eastern countries such as Iraq, Iran, Syria and Lebanon. During the initial meetings, children were present together with their fathers and mothers. Eventually only the mothers participated regularly together with their children. There were 8-12 mothers during each of these 9

sessions and about 15 children during each meeting (See Figure 1). Each meeting lasted for about two hours with 15 minutes break after the first hour.

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Aside from the participants and academic partners, the research team included representatives from the public and private sectors as well as non-profit organizations affiliated to the project such as the Primary care (Region Skåne), Pharmacy (Apotek Hjärtat), Save the Children and TePe Oral Hygiene Products. Not all actors were however present in all meetings; their presence was determined by the theme discussed on the different occasions. The presence of a private company among the actors involved in the project may raise questions related to conflict of interest. However, the relationship between the private company TePe Oral Hygiene Products and the research project was mediated by the mutual goal of creating social value for disadvantaged populations. Through their presence in the project, the company TePe Oral Hygiene Products aimed at understanding user needs in order to develop products and solutions for improved oral health in socioeconomically distressed communities. TePe Oral Hygiene Products had no financial gains through their participation in the research project. The head of their odontology and scientific affairs section was the primary representative of the company in the project. Additionally, the representative is also a specialist in pediatric dentistry, which made her presence useful since she could share her valuable knowledge, and experiences with the research team as well as participants. Previous studies have also considered academic-private partnerships in health research as an advantage rather than a limitation, because through such partnership emerges innovative strategies and positive effects which helps achieve higher public health goals [48, 49].

Patient and Public Involvement

The CBPR approach not only promotes involvement of the citizens of the community, but also relevant representatives of public and private organizations together with academic researchers in a power-balanced environment while working to identify and implement contextually relevant health promotional activities to promote behavioral change.

Design

The current study is a participative action research study with a qualitative approach where multistage focus group interviews were the mode of data collection. Multistage focus groups are characterized by the same group of persons exploring different themes during several meetings [50]. This method was inspired by Paul Freire's culture circles where the aim is to foster a participatory experience with an emphasis on dialogue and reflective action in response to an emancipatory health education [51]**.** The power relations are balanced within the circle, where one-person facilitates the discussions and debates by initiating the process. The facilitator then leaves it to the group to take responsibility for the progress in the inquiry process through self-reflections and sharing individual knowledge and experiences with each other. The dialogues help elevate the participants' experiences to a higher level of abstraction. The focus groups deduce individual learning, as well as collective ways of thinking through reflection and dialogue within the group. During each meeting, the participants try to identify a common problem in the community, explore the problem further to identify resources and solutions while simultaneously implementing them to bring about transformation [51, 52]. As a first step in this process, the participants gained knowledge from experts like dieticians, nurses or dentists, in the form of a dialogue exchange**.** Some examples of the topics selected by the participants include discussions on sugar content in their routine diet and possible healthy alternatives to it (with a dietician). Pediatric nurses provided information regarding

psychosocial support for behavioral change. The dental experts in this study were present during all occasions and added knowledge concerning oral hygiene, fluoride and the role of diet in relation to oral health.

Data Collection

Preliminary meeting

The families who agreed to participate met at nine different occasions once in two weeks over a period of six months beginning in September 2018. The first step in the multistage focus groups was to understand the participants' perceptions on oral health. Prior to the initiation of the actual activity sessions, the research team used a participatory research approach photovoice, to assess the complex phenomenon of diet from a sociocultural perspective among children. In this method, photography was used as a tool to understand the factors surrounding the actual problem in consideration, from within the context of the participants. This is also a form of qualitative research where the photos act, as a focal point to initiate discussion and promote better understanding of participants' needs. This method helps overcome language and communication barriers and enhances discussions within the group [53, 54].

The children were requested to bring pictures of healthy and unhealthy food and discussions were initiated based on their photos. In addition, they were also asked to take pictures of their toothbrush, as a base for discussing oral hygiene habits. The children sent the photographs via WhatsApp to the health promoter a few days prior to the scheduled introductory meeting. Photographs sent by the children were compiled, printed and later presented to the children for review together with the rest of the group. One of the team members initiated the discussion with the children using the pictures they sent and led the discussions.

Actions points from the preliminary meeting

Through the discussions during the preliminary meeting, it emerged that the children consumed a high amount of sugar as part of their daily diet. The children also expressed a dislike for the lunch served at school. It came to be known that most of the children did not eat breakfast owing to time constraints, family situation and cultural aspects. Through discussions with parents, it was understood that they had limited control over their children's dietary choices. Regarding oral health and oral hygiene, children frequently visited the dentist when they suffered pain, some had fillings and a few even had teeth extracted in early childhood. Concerning oral hygiene, there was a lack of awareness of fluoride use and its importance for oral health among children. It appeared that despite suffering tooth decay they were not informed about the role of fluorides in caries prevention. The session was followed by a debriefing and discussion with parents to understand their concerns about oral health of their children and the families in general. It emerged that parents were not satisfied with the tooth brushing carried out by their children. The children did not permit parents to help them with brushing despite being advised by the dentist or dental hygienist. In conclusion, parents felt the need for dietary advice focusing on the different meals, breakfast, lunch and dinner. In addition, they also wanted to gain more knowledge on oral hygiene habits. They preferred all sessions to be in the presence of the children since they would follow the advice of others better than they would do if the parents told them the same thing.

In the consecutive occasions, dialogue-based teachings or reflective dialogues were facilitated by experts in the related fields to address different challenges that emerged in the first meeting. Behavioral change in children through educating parents was also driven by the reflective dialogues. Previous studies [55] state that reflective dialogue-parental education is an effective method to enhance parental awareness and improve parenting skills. This is achieved through confidence building, which is promoted, by social support and peer

influence. The discussions in the group were predominantly held in Swedish and interpreted in Arabic by the health promoter for the benefit of some parents who could not speak Swedish. At the beginning of every meeting, families had the opportunity to provide feedback from the previous session. They also discussed their ability to make changes inspired by what was learnt from their participation and the challenges faced in doing so. All discussions were audiotaped with the consent of the families. A member of the researcher team also acted as an observer and was responsible for taking notes during each meeting.

Data Analysis

One team member [RR] reviewed audio recordings repeatedly to develop a content log of the discussions as well as summary. Listening to the recordings, several times facilitated rapid identification of codes together with the help of the observational notes. Two other members from the research team who were not involved in the data assimilation process listened to the recordings to complement the preliminary analysis performed by the first researcher [EC, MR]. Following this, the researchers discussed and reflected on their findings together and came to consensus over a final list of codes which were finally confirmed by [SBR]. The discussed codes were placed under categories and each category was further defined in detail to identify overarching themes. While data extraction was done using rapid identification of themes from audio recordings (RITA) method, qualitative content analysis with an inductive approach [56], was used to identify themes relevant to the research goals. The RITA method has previously been established as a method that yields prompt and detail results from qualitative data while also being less time consuming and less labor intensive [57-59].

Qualitative Rigor

Results from qualitative studies are evaluated based on certain criteria such as following Guba and Lincoln's criteria [60] as factors that predict the authenticity of the results. According to these criteria, the quality of results depends on the methods of data collection and the technique of data interpretation. The current study is built on the CBPR principles of co-learning and sharing thereby holding the contact between the researcher and community member's closer; thus, enabling better understanding and interpretation of information provided. Furthermore, the involvement of the health promoter at the different stages of the research process ensured open communication. This provided an opportunity for the participants to share trustworthy accounts of experiences to other members in the group ensuring credibility. The research team made observational notes describing the context to support the audiotaped data, which contributed to transferability of the findings. Dependability was attained by involving a third researcher who was not involved in the initial data collection and analysis to review the coded data. To achieve confirmability, the third member from the research team rechecked audio recordings and the observational notes in iterations. Findings were shared with participants and reconfirmed when necessary. Issues related to reflexivity was addressed using constant communication with the participants after each meeting, through peer debriefing, as well as triangulation by including several members in the research team in the focus groups as well as analysis of audio recordings. Self-reflexivity or personal reflexivity of the members of research team was considered rather positive since it gave the possibility for the team to reflect on power and privilege issues in relation to the context. This is also in line with guidelines indicated by prior work in participatory research [61].

Ethical Considerations

The Regional Ethical Review Board in Lund approved the study (DNR 2016/824). All participation was voluntary, and the participants were informed that they could leave the discussions at any time without any explanation or consequences. The parents received detailed information regarding the purpose and nature of the study, and were requested to provide written informed consent before enrollment. Parents were requested to consent their own as well as their children's participation. All invited participants consented both their own participation as well as that of their children. The children also gave a verbal consent. Participants were ensured confidentiality at the time of data collection. In addition, participants were also informed that all results were to be presented abstracted and presented at a group level and no individual shall be identifiable through their expressions in neither reports nor scientific articles that emerge from this study. This information was explained verbally, as well as, included in the information letter that they received when they signed the informed consent. Considering the nature and design of the multistage focus group, it may be difficult to ascertain confidentiality however, the research team explained to the mothers concerning this and requested them to refrain from discussing sensitive or personal opinions shared in the group elsewhere.

Findings

Three main themes including meaningful social interactions, family dynamics, and health trajectories were identified on exploring reflective thoughts and discussions in the focus groups with an aim to understand the process of changed behavior within the group.

Meaningful social interactions

The mothers reported in the beginning that they agreed to participate in this study since they trusted the health promoter. However, after a few meetings they began to enjoy the social aspects of being with new people especially since they would otherwise sit idly at home.

"In the beginning I came here because we knew the "health promoter". After coming here a few times, we started to interact with the others in the group. Now we do activities outside of this group, for example we go out on picnics or barbeque together. Coming here and meeting people is definitely better than sitting idle." (Mother, Meeting 8)

Although the mothers enjoyed the social aspects during the initial meetings, they began to look forward to interactions that were more purposeful and considered gaining knowledge as primary focus.

"It is not just for meeting others. It is good that I get information about healthy food and what a good breakfast is for both my children and me. I just do not go there every time to meet someone else. We can do that in a different way." (Mother, Meeting 8)

The mothers in the group believed that the discussions and information they received were better than what they had received from the nurses at the primary care. They highlighted the importance of being in a group in the learning process since the discussions were interactive and not controlled or determined by the facilitators or field experts.

"When we meet a nurse at a primary care center, they sound tired and disinterested and hence do not provide the same information we get here. It was not of good quality neither educational nor motivating as we do here within the group." (Mother, Meeting 6)

The mothers felt that they were given not only the opportunity to gain new knowledge and learn, but also the possibility to discuss and share their own knowledge and experiences. They also gave and received tips from each other within the group.

"It was not just a lecture, we got to ask, discuss and learn from the experts and from each other. It was fun to give tips and suggestions to each other based on our experiences." (Mother, Meeting 7)

Some of the mothers were unsure from the beginning if they could make changes to their diet. After participation for a few weeks, they felt motivated and gradually started to make changes.

"In the beginning I was drinking 5-6 liters of juice a day, after being here I have reduced it to 1 liter per week. I initially thought that I can't but when I was told about the sugar content of the juice and learnt about others changing their dietary patterns, I too decided to change." (Mother, Meeting 7)

Towards the end of the sessions, several mothers expressed their interest in communicating the knowledge they gained to the rest of the community, as they believed that the information was important. They even went a step further and mentioned that they would like to join the research team in the future to support the mission to improve oral health among the population in the neighborhood.

"I want to be one among your team, you are few and there are many people who need help so I want to help others as you do." (Mother, Meeting 8)

Children in the group were also interested in spreading their knowledge to their friends and classmates. One of the children in the group had already begun speaking about sugar intake and oral health to his class.

"I told my classmates about why eating sugary things is harmful and how sugar affects the teeth. My teacher was impressed with me and wanted me to share more information in the class after each meeting." (Child, Meeting 6)

Family dynamics

The role of individual members in the family, bonding and interactions between family members together with socio-cultural or traditional values carried within the family, influence lifestyle and behavior of the children. Acculturation and migration also have an influence on the relationship between children and parents, specifically mothers. Thus, a sustainable change in diet of children is influenced by family dynamics.

Mothers in this study perceived that they had important responsibilities but were merely limited to executing actions with little influence on decision-making. This was considered as a direct challenge in promoting dietary changes in the family.

"I am a woman I can decide only for myself, I cannot tell my husband what he has to eat. My children eat what their father eats. I drink a lot of tea and my children drink tea too. It is our tradition." (Mother, Meeting 2)

Children in the families acknowledged their traditional practices and consumed high amount of sugar as part of it. They believed that following the parent's action was also associated with culture.

"We drink tea as a family in the evenings and during weekend. I cannot drink tea without sugar in it. I usually put four teaspoons of sugar in my tea. That is how my parents drink too. It is a cultural thing." (Child, Meeting 1)

From the discussions with the children, it emerged that they were often alone when they ate breakfast so they ate whatever they found in their refrigerators.

"I eat breakfast alone and I eat whatever is available in the refrigerator. I mostly eat bread with Nutella, as it is easy to make. My mother goes to work and my father is still sleeping then. My brother never helps me even if I ask." (Child, Meeting 3)

Some mothers believed they could not provide enough attention to their children's diet due to lack of time and a stressful life in Sweden. Mothers also believed that fathers could not help children, as well as, the mothers as men have low involvement in the upbringing of children. After participation in the activities, the mothers found a solution to this through the tips they got from fellow participants.

"I leave early to work and my children eat breakfast by themselves. My husband cannot prepare food and take care of the children, sometimes he forgets everything, he miss to put on their wooly caps in winter. It is cultural" (Mother, Meeting 2)

Mothers valued the involvement of children in the activities since they recognized changes in children's behavior at home after participation. Children were more cautious about their diet and sought their parents´ help while brushing their teeth, which they refused to do previously.

"The good thing is that we got to be here with our children, and that they also got to listen and learn. They have become more responsible at home; my son does not want to eat as many bananas as he did earlier because he has learned that it has more sugar. He wants me to help him brush his teeth; he would never allow me to do it before even if I insisted. "(Mother, Meeting 5)

Mothers were initially unsure about influencing the diet and lifestyle of their spouses, but when they made changes for themselves their husbands chose to do so too. In some households, women brought home information material from the meetings to convince their husbands.

"At first I thought it might be hard for me to influence my husband, but when I changed my own diet he chose to change his too," (Mother, Meeting 8)

"When I told him about sugar content in each food and showed the sugar brochure my husband was shocked and immediately decided to change."(Mother, Meeting 8)

Health trajectories

When the mothers initially volunteered to participate in the activity and attended the meetings, they were concerned about their children's oral health behavior and diet. From the initial discussions with parents and children it emerged that children frequently consumed sugar in form of candies, juices and tea with sugar, which was a part of their tradition. Parents were also worried since children frequently complained of toothache and some of them had several fillings or a lost tooth.

Some parents even believed that they needed some amount of added sugar for normal body function. Parents were unable to monitor and control their children's sugar intake.

"I must have juice in the refrigerator all the time because my children want to drink juice once every hour. I cannot say no to them because they will not eat anything else. I can't help but buy juice as I also like it." (Mother, Meeting 1)

After participation in the activities, mothers reported a sense of satisfaction and relief since they were able to take control over their situation and bring about change, promoting a healthier lifestyle for their children. This in turn made them happier and they slept better.

"I felt bad when I realized that it was me who bought juice and sweets. I understood that if I stop buying things it would help my family. Since I did that, I sleep better because I know I have provided healthy food to my children." (Mother, Meeting 8)

Children in the group were particularly excited about learning to brush their teeth from experts and the use of different kind of toothbrushes. They also spoke about the relationship between healthy teeth and healthy living after participation in the discussions.

"It was fun to see all the different brushes. I never knew there existed so many. I learnt to brush my teeth. I think that we must brush our teeth well since it makes us feel healthy." (Child, Meeting 7)

Mothers began to understand the influence of diet on their health more distinctly after participation in the activities. Mothers reported a change in self-perceived health owing to behavioral change after participation in the activities.

"Since I made changes to my diet, I started feeling fresher and healthier. I was at the doctor last week and he was surprised because I have lost weight." (Mother, Meeting 8)

Participants began to understand the connection between oral health and general health and well-being after having participated in the activities.

"Through participation in this activity I have learned about the connection between oral health with general health. I have actually seen a change in my physical health." (Mother, Meeting 8)

Discussion

Participation in the health promotional activities led to changed oral health related behaviour, and appeared to empower mothers and children, to gain control over their health, which in turn extended into the entire family as illustrated in the main findings social interactions, family dynamics and health trajectories. The analysis also draws on Zimmerman's (1995) definition of psychological empowerment, which includes the dimensions of people's perceived control of their lives related to their level of participation in community change [62].

The current study shows that a participatory dialogue and reflection, targeting behavioral change considering the actual needs of the community may initiate lifestyle changes among socially disadvantaged immigrant families compared to mere personal dietary counselling in primary care centers or at the dental clinics. This is in line with a previous study [63] which shows that dietary counselling offered by health care workers is frequently inconsistent, unclear - and beyond all - not culturally tailored and hence not effective in promoting dietary changes. On the other hand, in participatory research, participants are engaged in a collaborative process of social transformation, which enhances the possible uptake of knowledge through reflection within a social circle [64]. The role of mothers as important channels for behavioral change in the families is in line with a previous study based on oral health educational interventions involving immigrant families with children living in Australia [65]. However, the intervention offered in the Australian study was a predetermined intervention, unlike in the case of this study where the participants determined the health promotional activities. In addition, the health promotional activities in the current study were implemented over a longer period with frequent visits and involved children aged 7-14 years in contrary to the Australian study where the intervention was provided for 3-4 weeks and children of younger age (1-3 years) were included. Involving older children in the discussions

offered an additional benefit, as they were also active during the sessions, had the opportunity to ask questions, learn from experts, and thereby made changes in their lifestyle.

The interaction between individuals in a group appeared to exert a strong influence on the behaviors, which was beyond the mere social aspect of meeting people to break isolation. The process involved utilization of collective knowledge to bring about changes in daily life through mutual sharing and motivating each other. These results are in line with discussions in a review study [66] that shows that participation in interactive lifestyle interventions in small groups better promotes behavioral and lifestyle changes. This is because individuals in a group are often in similar situations and through being role models to each other even the harder to convince participants in the group tend to change [66]. Similarly, according to an earlier study , social interaction between children is known to help in shaping their cognition, altering their attitudes, beliefs as well as understanding of reality that in turn promotes behavioral changes [67].

The findings from the current study are in line with a previous study which describes the process of change in parental conception following reflective dialogues which facilitated behavioral changes in four stages including awareness of one's current conception, dissatisfaction with one's current conceptions, support and understanding from others, exposure to alternate ways, opportunities for encouragement and reflection [55]. According to Freirean principles which states that the consequence of offering knowledge via dialogue as a tool enhances the individuals control over self and their beliefs thereby leading to self-empowerment [68] and such an empowerment may result in behavioral change [69]. These principles were exemplified in the current study where the mothers in the group became conscious and aware of what constituted the meals they served their families through reflecting on the images of their own breakfast during the initial meeting. Further, through participation in the group meetings they realized that they had a significant role in promoting

a healthier diet to the rest of their family. Despite being frustrated in the beginning, they eventually found support from other participants in the group who were in similar situations. The support, understanding, mutual respect and caring shared among each other in the group tended to have made the mothers psychologically stronger to accept the fact that their families did not consume healthy diets. They began welcoming alternative conceptions that they were exposed to both from the different actors providing knowledge as well as through interaction with other members in the group with varying perceptions. Over time, the participants progressed from a stage of seeking knowledge to sharing knowledge through providing tips to one another as well as to their friends and relatives in the community. The mothers expressed a feeling of confidence in self and appeared to be empowered after participation, which they were lacking in the beginning of the study when they really felt powerless due to their inability to take control over their children's oral health related lifestyle.

Practical Implications

It became known through this study that brochures and health education material used in the Swedish health care were adapted to the Swedish context and were considered less useful for needy communities. The participants believed that educational material showing sugar content in various food products would help understand sugar intake among families in socially disadvantaged neighborhoods. As a part of the activities, participants learnt to read and understand the ingredients list printed on the package of different food products. They also learnt to convert the quantity of sugar in grams to sugar cubes, which helped them communicate and spread the knowledge they gained. Participants gathered photographs of food products and some culturally specific dishes which they wanted to include in a new brochure. Together with the actors in the research team and a dietician, the participants

developed a sugar brochure. The sugar brochures were printed in multiple copies by TePe and distributed to the participants. The brochure was also shared with the primary care, dental care and pharmacy for further dispersal of the material. The participants, both mothers and children found the brochure as a concrete tool for informing their family and friends in the community about the harmful effects of sugar consumption. The mothers in the group became oral health ambassadors in the community and started an initiative "Fight against sugar intake". They organized small gatherings with other women in the community to talk about the knowledge they gained from their participation in this study, together with the help of the brochure. Some of the children in the group who expressed interest to learn more about oral health, diet and healthy lifestyle were specially educated by experts from TePe over a period of one month with one lecture a week. After participation in the educational sessions, the children were certified as child oral health ambassadors. These child oral health ambassadors began spreading their knowledge in their respective schools.

Limitations

The current study could have been complemented with a quantitative assessment to explore changes in oral health related behaviours after participation in the activities. Such an evaluation is planned with this group using a participatory approach where health promoters will have an active role in distributing health surveys and analyzing them together with researchers.

Another potential limitation in this study is the non-participation of fathers, which may have introduced a selection bias. This however does not undermine the value of the findings from this study. Fathers in this study decided not to participate in the activities since mothers had the primary role of raising children and steering their behavior in these communities. This is

also in line with prior research on family traditions and the significant role of mothers in raising children [70, 71]. A notable feature in multistage focus groups used in the current study is that participant dynamics may change during subsequent meetings in that new families take part or some of the original families do not take part in some of the meeting series. According to previous studies, the introduction of new members have a positive effect in that new discussions that emerge and more knowledge is generated [51]. However, in the current study it must be noted that eight to twelve families attended almost all meetings while there were also a few new families in every occasion, which steered new discussions and new perspectives that benefitted even those families who came regularly.

The rapid identification of themes from audio recordings may be considered a methodological limitation. However, in contrast to the original method of listening to the audio for three minutes [57], the themes were identified after listening to the entire audio recording several times. In addition, extensive field notes were collected during each of the nine sessions, which was used as complementary information to the audio recordings during analysis. Aside of this the research team also had a deeper understanding of the participants' views from a contextual perspective owing to their prior engagement with participants in the trust-building phase, which was also enhanced by the involvement of health promoter.

Conclusion

The current study highlights the importance of working with the family, to ensure sustainable lifestyle changes. Placing the focus on both the process of change as well as the action paved ways to explore how families experienced their participation in the activities offered as well the determinants of behavioral change. Providing mothers and children with the knowledge

and skills to promote oral health behaviors influences not only their immediate family but also their communities or social groups. However, the success of knowledge transfer is mediated by the principles of participatory research that strengthens and appeared to empower individuals, and may contribute to a healthier society and reduced health disparities.

Reflective dialogue and interactions within the social context influences the health promotion process, and through the participatory approach, individuals seem to gain empowerment that in turn can lead to behavioral change. Such a strategy can be considered in future work targeting to promote health in disadvantaged populations.

Competing interests

The presence of a private company TePe Oral Hygiene Products, here represented by the fourth author (ANO) who is the head of the odontology and scientific affairs section may raise questions related to competing interests. However, ANO aimed at understanding user needs in order to develop products and solutions for improved oral health in socioeconomically distressed communities. TePe Oral Hygiene Products represented by ANO had no financial gains through the participation in the research project. The representative from Apotek Hjärtat, private pharmacy was a trained pharmacist who participated in some of the sessions to inform the participants about the oral health related side effects of different medications such as dry mouth and how these can be prevented or treated. They did not have any financial gains from their participation in this study. A representative from the non- profit organization, Save the children participated in all the session with an intention to offer children and mothers in the group social support and counselling if sensitive issues were discussed. They also informed the participants concerning child rights. The representative from the primary care (Region Skåne)

was a dietist who was active in the sessions where diet was the subject of discussion, as well as, in the development of the brochures.

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Authors' Contributions

RR, EC, SBR, ANO, AK and MR conceptualised and designed the study. RR, SBR, ANO and MR collected data. RR, EC, MR and SBR analysed the audio recordings. RR wrote the initial version of the manuscript under the guidance of AK, EC and MR. All authors gave detailed feedback on early iterations of the manuscript. All authors have read and approved the final version of the manuscript.

Data Sharing Statement

The audio recordings from the focus groups generated and analyzed during the current study are not publicly available due institutional policy and GDPR regulations but are available from the corresponding author on reasonable request.

Legend of Figure 1

Chronological timeline of the multistage focus group interviews.

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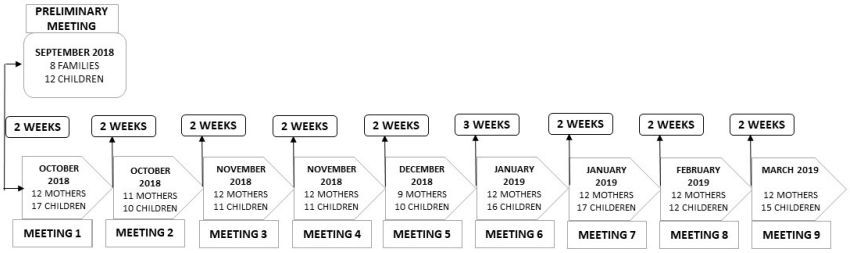

Figure 1:Chronological timeline of the multistage focus group interviews

338x190mm (96 x 96 DPI)

Reporting checklist for qualitative study.

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Instructions to authors

Complete this checklist by entering the page numbers from your manuscript where readers will find each of the items listed below.

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		Reporting Item	Page Number
Title			
	#1	Concise description of the nature and topic of the study identifying the study as qualitative or indicating the approach (e.g. ethnography, grounded theory) or data collection methods (e.g. interview, focus group) is recommended	1
Abstract			
	#2	Summary of the key elements of the study using the abstract format of the intended publication; typically includes background, purpose, methods, results and conclusions	2
Introduction			
Problem formulation	#3	Description and signifcance of the problem / phenomenon studied: review of relevant theory and empirical work; problem statement	3-7

Purpose or research question	#4	Purpose of the study and specific objectives or questions	8
Methods			
Qualitative approach and research paradigm	#5	Qualitative approach (e.g. ethnography, grounded theory, case study, phenomenolgy, narrative research) and guiding theory if appropriate; identifying the research paradigm (e.g. postpositivist, constructivist / interpretivist) is also recommended; rationale. The rationale should briefly discuss the justification for choosing that theory, approach, method or technique rather than other options available; the assumptions and limitations implicit in those choices and how those choices influence study conclusions and transferability. As appropriate the rationale for several items might be discussed together.	11
Researcher characteristics and reflexivity	#6	Researchers' characteristics that may influence the research, including personal attributes, qualifications / experience, relationship with participants, assumptions and / or presuppositions; potential or actual interaction between researchers' characteristics and the research questions, approach, methods, results and / or transferability	15
Context	#7	Setting / site and salient contextual factors; rationale	9
Sampling strategy	#8	How and why research participants, documents, or events were selected; criteria for deciding when no further sampling was necessary (e.g. sampling saturation); rationale	9-10
Ethical issues pertaining to human subjects	#9	Documentation of approval by an appropriate ethics review board and participant consent, or explanation for lack thereof; other confidentiality and data security issues	15-16
Data collection methods	#10	Types of data collected; details of data collection procedures including (as appropriate) start and stop dates of data collection and analysis, iterative process, triangulation of sources / methods, and modification of	12

		procedures in response to evolving study findings; rationale	
Data collection instruments and technologies	#11	Description of instruments (e.g. interview guides, questionnaires) and devices (e.g. audio recorders) used for data collection; if / how the instruments(s) changed over the course of the study	12
Units of study	#12	Number and relevant characteristics of participants, documents, or events included in the study; level of participation (could be reported in results)	10-11
Data processing	#13	Methods for processing data prior to and during analysis, including transcription, data entry, data management and security, verification of data integrity, data coding, and anonymisation / deidentification of excerpts	14
Data analysis	#14	Process by which inferences, themes, etc. were identified and developed, including the researchers involved in data analysis; usually references a specific paradigm or approach; rationale	14
Techniques to enhance trustworthiness	#15	Techniques to enhance trustworthiness and credibility of data analysis (e.g. member checking, audit trail, triangulation); rationale	15
Results/findings			
Syntheses and interpretation	#16	Main findings (e.g. interpretations, inferences, and themes); might include development of a theory or model, or integration with prior research or theory	17-22
Links to empirical data	#17	Evidence (e.g. quotes, field notes, text excerpts, photographs) to substantiate analytic findings	17-22
Discussion			
Intergration with prior work, implications, transferability and contribution(s) to the field	#18	Short summary of main findings; explanation of how findings and conclusions connect to, support, elaborate on, or challenge conclusions of earlier scholarship; discussion of scope of application / generalizability; identification of unique contributions(s) to scholarship in a discipline or field	23-25

Limitations	#19	Trustworthiness and limitations of findings	26-27
Other			
Conflicts of interest	#20	Potential sources of influence of perceived influence on study conduct and conclusions; how these were managed	28
Funding	#21	Sources of funding and other support; role of funders in data collection, interpretation and reporting	29