

South African rural community understanding of fermented foods preparation and usage

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ABSTRACT

Background: The benefits of fermented foods consumption have been demonstrated in a number of research reports. These qualities have been demonstrated, for example, to reduce childhood diseases such as diarrhea and malnutrition. Thus, fermented foods may be recommended for improving the health and nutritional quality of traditional African foods and regular inclusion of fermented foods as part of the daily diet would be desirable. **Aims:** Lack of knowledge and understanding toward fermented food preparation may limit their usage. This study explores the South African community's understanding of fermented foods preparation and usage. **Materials and Methods:** This was a qualitative study using focus group interviews to determine the community's understanding and their perception of fermented foods preparation in the rural villages of Odi, in Gauteng Province between May and June 2012. The target population was the caregivers of children under 5 years, attending the hospital's antenatal clinic at the time of study. The information was transcribed, coded, and analyzed using NVivo software. **Results:** Most caregivers were aware of food fermentation process, and some of them could not clearly differentiate between fermented and unfermented foods. Although most participants knew what fermented foods were, there were misconceptions on how they were made. This was exemplified by the undesirable artifacts, labeled as ingredients, in the fermentation process. **Conclusion:** Caregivers demonstrated a fair knowledge of fermented foods but lack a standard preparation procedure for these foods. There is an urgent need to educate communities and conduct a health promotion campaign on the fermented foods and probiotics.

Key words: Fermented food, lactic acid bacteria, probiotics, starter culture

INTRODUCTION

Fermented foods belong to a category of foods called "functional foods that are known to have positive effect on health."^[1,2] Probiotics are the bacteria (termed lactic acid bacteria [LAB]) used to ferment traditional foods, and they are the most reported and researched. Thus, fermented foods and probiotics closely related and co-exist,^[3] despite the

increased commercial interest in probiotics due to the health attributes associated with them. However, the efficacy of probiotics is enhanced when taken in the form of fermented food rather than as probiotics alone.^[4] LAB fermentation is a traditional method used for over a 1000 years throughout the world to preserve indigenous foods. The benefits of fermented food usage include prevention of lactose intolerance, immune system boost, reduced malnutrition, and diarrheal diseases caused by bacteria and rotavirus.^[5,6] They also play a great role in infant weaning as they prevent infections that are foodborne.^[7] It is believed that fermented foods and

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probiotics can immensely contribute to food security and by enhancing the livelihoods of the rural and urban communities in developing countries like South Africa.^[8]

Lack of knowledge on fermented foods and how they are made deprives the rural communities of the opportunity to fermented foods correctly in order to reap the health benefits offered by these foods. Although this is one of the oldest technologies used for food preservation for a number of centuries, it has not been efficiently transferred to newer generations.^[9,10] Instead, most communities have adapted the exotic Western diets as they have lost their traditional roots and seldom use these foods. The newer generation may also be unaware of their nutritional benefits. However, in certain African countries, fermentation is still embraced as a means to prepare complementary foods for young children and infants.^[11,12]

Research reports show that in the regions where rural communities mostly subsist on specific traditional foods, the pattern of diseases is different to those who consume modern exotic diets.^[8,10] Given the benefits that can be derived from traditional fermented foods, there is need to promote their preparation, perception and usage among both rural and urban communities. The leading author's personal experience with some of the South African communities shows that fermented foods are not commonly used. The author understands the probiotic and nutritional value of fermented foods in public health, based on his previous research findings.^[13] There are no published reports on the communities understanding, perception and use of fermented foods in South Africa. This study was therefore designed to explore the understanding of fermented foods by a South African rural community. This being an explorative study, qualitative approach is a better option to collect data.

SUBJECTS AND METHODS

Study design

This study employed a qualitative descriptive approach to explain the understanding of caregivers on fermented food preparation and usage. The caregivers were recruited in the antenatal clinic at Odi Hospital. Child caregivers are those people who are caring for the total welfare of the infants/young children. They could be single parents (father or mother), foster parents or those entrusted with the task for one reason or the other legally. The study only proceeded after obtaining ethics approval letter from Medical Research and Ethics Committee at the University of Limpopo. Permission was also sought from the clinic manager. Data were collected between January and May 2012.

Data collection

Focus group discussions (FGDs) were conducted by the authors and a research assistant, all trained to conduct focus group design studies. A FGD guide with open-ended

questions was used as a data collection tool. Some questions asked in the tool were: What types of fermented foods do you prepare at home; what type of fermented foods do you buy; how do you ferment foods at your home; what are the benefits of feeding fermented foods to children under the age of 5 years. As most clinic attendees were Setswana speaking, the guide was developed in English and translated into Setswana. Thus, the inclusion criteria were being Setswana speaking and having and/or caring for children under the age of years. The caregivers were approached on the day they were attending to in the antenatal clinic. Recruitment was done in the morning as they waited to be attended to by the healthcare workers.

The participants who were interested in participating, and met the study criteria, were informed about the study. They were then requested to give a signed informed consent. Three FGDs were conducted in Setswana. With the permission of the participants, digital audio recorders were used to capture all FGDs that lasted about 45–60 min. A total of 3 FGD were conducted in this study with an average of 10 participants per FGD. A total number of 33 participants were interviewed. Participants were purposively sampled and involved conducting one FGD per week in a dedicated room at the hospital. Participants' demographic data, such as age, education, employment status, number, and age of children, were obtained using a self-administered questionnaire form. Data were collected until data saturation was reached. Saturation of data occurred when the last FGD discussion provided no new information from previously collected data.

Data analysis

All recorded transcripts were transcribed verbatim in the local language (Setswana) by a trained transcriptionist who is fluent in Setswana language. The transcripts were further translated into English by the authors. Following the transcription and translation, the authors listened to tape recordings and checked the written transcripts for data accuracy. The researcher then read the transcripts several times to identify themes and categories relating to the knowledge and use of fermented foods for infant feeding. In the first-level of analysis, the researchers identified the codes and developed a consensus on the meaning of the codes as they emerged from the data. This was followed by second-level coding from the where similar codes were merged, and a code list was finalized. Translated transcripts in Microsoft Word version were then uploaded into NVivo version 8 (QSR International PTY Ltd, Victoria, Australia) together with the code list, and data was coded. This ensured that data analysis procedure was reliable. Data were then presented thematically, and direct quotations were provided to support the identified themes during data presentation. Care-givers' demographic profiles were used to describe the participants. Credibility was assured by the two researchers developing the code list in consensus, and the researchers verified the consistency of coding through member checking.

RESULTS

Participants' information

The data from this study are presented from three focus group interviews following the recruitment of mothers of young children below 5 years. There were 33 caregivers, participants were recruited and allocated into 1–3 FGDs within the 4 weeks of the study. All the participants were women between the age of 18 and 44 years. We could not get the demographic details of four of the caregivers as they were in a hurry to leave to collect their medication from the clinic pharmacy. Thus, we managed to get the details of 29 caregivers. The majority (over 60%) were single mothers and most of them (76%) were unemployed. Most of these caregivers (66%) had secondary level of education. All participants had at least a child below 5 years.

Themes

There were six major themes that arose from data analysis as shown in Table 1.

Types of fermented foods

Participants mentioned types of fermented foods which were homemade and those that they bought from their local shops. In some cases, there was an overlap of bought and fermented foods as some of the foods were also sold ready-made in the local tuck shops and retail delicatessens.

Fermented foods that are homemade

Caregivers could identify some of the types of fermented foods available in the village such as mageu, ting, pastries, and amasi (fermented milk). Fermented foods that are made at home within the Odi district hospital catchment area were mageu, ting, fat-cakes, dumplings, amasi, bread, and sorghum beer. Frequent responses across the three FGDs were like this:

“You know what? When they talk about fermented foods they mean things like ting, the ones that you can cook but ferment them firstly” (34-year-old mother of two children).

Mageu it's pap, then you pour flour and then you put it in the sun with a little bit of water so that it can ferment, and when it starts to ferment it gets sour (18-year-old mother of one child).

Ting porridge (It is a sour porridge made of sorghum), bread (A mother with missing demographic details).

Most caregivers talked of traditional beer like *motonyonyo* which they sometimes give to small children because it

relieves constipation. Like a 30-year-old caregiver of two children who said:

“It is that the traditional Setswana beer we also ferment it when we talk to our ancestors or something and I occasionally give it to my child because it cleans the tummy... and I give only one cup.”

“Phaphatha” in “Setswana or Mapawa” in Shangaan was identified as a pastry that is mildly fermented and can be used to feed adults and children.

Fermented foods that are bought

All the foods that were made at home were also sold in the local shops, but it was a consensus across all participants in the FGDs that they do not make yoghurt in their homes.

For me the ones that I buy from the shops are the same ones that I make myself at home, fat cakes, ting, sour milk, dumpling and mageu (Participants agreed with her): (34-year-old with two children).

Although the caregivers sometimes bought fermented foods from the local shops, they reported that they are not sure of how it was fermented or prepared.

Mbhali (No demographic data) said “We buy this ting pap from the shops, they cook it at shoprite, they make it to be a bit softer... they do ferment it. And also fat cakes. Mostly they don't use baking powder they use yeast and mostly at SPAR they sell it in plastic bags,... they use self-raising a lot...” (Group consensus).

When asked why they bought some foods that they could make for themselves at home, some participants reported that they buy ready-made fermented foods when they do not have enough time in a day to prepare the food, like especially when they attend their clinic appointments:

Yes it's time, I spent most of my day here... as you can see right now I'm here at the clinic, I'm hungry, I'm going to buy mageu or pap and eat Sarah (33-year-old mother of one child).

Methods of fermentation at home

Caregivers could describe the traditional fermentation process at home. Traditional beer was a common fermented drink they made at home.

Where I'm staying, most people eat ting or dumpling, these are the most common fermented food (Laughing). Traditional beer it is also fermented, we forgot to talk about it... With traditional beer you will take a tank... It's a big container, but it depends on the size of the occasion, let's say you're using your tank you can use 12.5 kg of maize meal, you take maize meal and pour inside that container and you boil water, after pouring the maize meal inside the container you also pour mthombo mela and stir, after stirring well you close so that the maize meal can be able to ferment well. Later you pour water again, you stir and after that you pour mthombo mela again on top, after that you close. Let's say you've finished with the mixing this evening, tomorrow when you wake up

Table 1: Emerging themes from the study

| |
|---------------------------------------------|
| Types of fermented foods |
| Fermented foods that are homemade |
| Fermented foods that are bought |
| Preparation of fermented foods |
| Methods of fermentation at home |
| Artifacts of fermenting and fermented foods |

it will have fermented, then you leave it so that it can have some foam, with other people you find that it's not well fermented, like being sweet when you taste it, then they buy chibuku and pour it inside because it assist that beer to ferment faster. After pouring chibuku you will see it fermenting and a foam coming out, and when you taste it, it will be sour then you can start preparing it (34-year-old mother of two children).

Artefacts of fermented and fermented foods

Mothers discussed some issues especially in the fermentation process which were not easy to directly link them to fermentation. These include:

It depends whether you have a hand to ferment or not (33 mother of two).

The way they explain it is like that, but how, I don't know. They say there are people who have a hand that makes fermentation process to be quick, but how, I don't know. (Other participants laughed here) but at the end fermentation happens, whether it takes longer or faster... Just like sometimes when there's a function and they feel that they have started late to ferment, let me say on Wednesday, they take ting and put it inside a bucket, thereafter they insert a potato and warm water, they say the potato makes ting to ferment faster (34-year-old mother of two).

Yes, ting ya mabele (sorghum) you use, in most cases I use, mabele, I put the silver spoon inside the bucket, I take low boiled water and pour it in the bucket then I wait for two days for it to get sour... A spoon, stainless steel... For it to ferment it's caused by that spoon that I've put inside and there's nothing else that I put inside, if I don't put the spoon I insert the potato (A mother with missing demographic data).

DISCUSSION

This is the first South African study to explore the rural community's understanding of food preparation and usage. It is evident from the study results that most of the study participants were women, most of them being the biological mothers of the children they cared for. This is expected as women are the main primary child caregivers in South Africa. Moreover, women play a major role in providing household food security through food processing and preservation.^[14] Thus, this was the appropriate gender to interview in the study.

It is also notable from the results that the caregivers had convincing understanding of fermented foods, as they could clearly explain the process of food fermentation at home. It is believed that their source of knowledge on indigenous fermentation was inherited over the years through a number of generations. A review of household fermentation techniques in Africa and Asia is also available.^[8,15,16]

The findings in this study show that the rural communities have access to both commercial and homemade fermented foods. Participants expressed preference to homemade

fermented foods, but lack of time to prepare homemade food forced them to buy commercial brands. However, commercial foods found in the shops are prepared differently from the ones at home. Commercial foods, such as yogurt and milk, are made in a larger scale, and specifically selected strains of LAB starter cultures are used in the fermentation process.^[17] In the selection process, a number of factors are considered and these include safety (production under sanitary conditions), functional properties which include the ability of LAB to colonize the gut, antimicrobial production, and adherence to the colon. However, in a number of commercial products, most of the bacteria are killed as a result of the modern processing techniques. Thus, the important and traditional contribution of fermented foods toward health is drastically reduced. It was encouraging to learn most of the fermented food consumed in the community of the current study is homemade, a trend that should further be promoted.

The health safety of fermented products depends largely on the process and the hygienic conditions followed during their preparation. For example, some fermented foods, e.g., togwa prepared in Tanzania, may pose a safety risk.^[9] Thus, industrial prepared products may be safer in terms of hygiene but may not have the same the richness that the traditional products have in terms of microbial flora and taste. In this present study, there were no reports on safety precautions during fermented food preparation. Therefore, hygiene standards in the community setup needs to be improved in order to reap the benefits of indigenous fermented foods. This is particularly important as most communities in the neighborhood of this study setting, live in temporary shelters and are in short supply of clean water.

In this study, the participants mentioned some artifacts that they believed enhanced the fermentation process of foods. These were items such as nickel spoons and potatoes. These artifacts have not been proven scientifically that they affect the fermentation process in any way. These are some of the myths that need to be discouraged or downplayed in the communities by providing the factual information on how to prepare fermented foods. Previous studies show that at home, natural fermentation is allowed to take its course, a process often termed "spontaneous fermentation." In this case, no specific bacteria are added to the ferment.^[18,19] This is because LAB are ubiquitous in the environment,^[20] and thus, it may not be necessary at times to add specific strains (starter cultures) into the ferment. In some circumstances, a portion of the old ferment is added into the new ferment to speed up the process. This is called back-sloping.^[21]

It is however notable that some additives in the form of ingredients may influence the beneficial outcome of the fermentation process. For example, the presence of bread flour and yeast in the ferment mixtures led to the highest increase in protein content of the ferment during *amahewu* (A South African fermented maize product) preparation.^[13] In this study, participants mentioned the addition of malt (*mthombo mela* or *chibuku* in Setswana) to speed up the

fermentation process of traditional beer. The malt is sourced from commercial outlets and is prepared by making flour out of dried germinated sorghum or finger millet. Malt is a desirable additive that has been reported in other studies as well.^[22,23]

Traditional fermented foods are usually prepared in a variety of vessels depending on the culture and the region where the community dwell. For example, the Maasai of Kenya prepare fermented milk in smoked calabashes (used as fermentation gourd)^[24] while in South Africa, fermented milk, *sethemi* was prepared in gourds and clay pots.^[25] It has been argued that the type of container used in fermentation may influence the characteristics of the fermented product in terms of the taste, or microbial flora and safety. Kebede *et al.*^[25] reported that the fermentation vessel did not affect the LAB count although clay pots and gourds had higher yeast counts than other vessels used (plastic and nickel containers). It may seem, therefore that any container may be used preferably if they can be cleaned easily to maintain hygienic standards. In this current study, large metal tanks (*faki* in Setswana) are used to prepare beer, especially for big occasions. However, in small family setting, clay pots are reportedly used.

The limitation of this study is that the participants were mainly from a rural setting and thus, the findings may not be generalized to the whole of South African communities. Additionally, this was an explorative study that involved a limited number of participants who were also relatively young in age. A descriptive quantitative study, involving a larger number of participants and covering both rural and urban settings is underway. The data from this later study will further corroborate the findings of the current study.

CONCLUSION

This study has shown that although the child caregivers in the community of the study setting know and understand what fermented foods are, they are not following standard procedures to make them at home. This is evidenced by the artifacts reported in the discussions as part of the preparation process. There is clearly need of health education of community members on characterization and optimization of fermentation processes and use of suitable starters in the fermentation procedures. Hygienic safety is also a procedure that needs to be highly recommended to those preparing these foods.

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Conflicts of interest

There are no conflicts of interest.

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