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THOMSON REUTERS
International Journal of Medical Research and Pharmaceutical Sciences
Volume 4 (Issue 6): June 2017 ISSN: 2394-9414
DOI- 10.5281/zenodo.809207 Impact Factor- 3.109

A STUDY PROTOCOL ON COMMUNITY ACCEPTABILITY OF VEGETABLE OIL BLENDS WITH RED PALMOLEIN- A SEMIRANDOMIZED STUDY

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Keywords:

Abstract

Vegetable oils are the rich source of vitamins and various essential fatty acids. The blending of the vegetable oils gave double benefit to health. Among the vegetable oils, red palm olein is the richest source of carotenoids and prevent the hyper cholesteremia. Prevalence of hyper cholesterolemia was 56.4% in Kerala. Availability and consumption of blended vegetable oil help to prevent the hyper cholesteremia in a way. In this study, we aimed to know the acceptability of the blended vegetable oils in the community. This study follows concurrent mixed method. Qualitative phase considers knowing the perceptions associated with the acceptability of the vegetable oil consumption and the quantitative phase consist of the factors influencing the acceptability of the blended vegetable oil consumption. We are planning to provide the vegetable blended oils in three different groups (intervention) and normally preferred vegetable oil for the control group. Finally, we are comparing the experience of consuming blended oil and other normal vegetable oil of the participants.

Introduction

Cooking oil is plant, animal, or synthetic fat used in frying, baking, and other types of cooking. It is also used in food preparation and flavoring that doesn't involve heat, such as salad dressings and bread dips, and in this sense might be more accurately termed edible oil. Cooking oil is typically a liquid at room temperature, although some oils that contain saturated fat, such as coconut oil, palm oil and palm kernel oil are solid at room temperature. The commonly used vegetable oils are coconut oil, palm oil, sunflower oil, rice bran oil, olive oil, sesame oil, peanut oil, corn oil, safflower oil and other vegetable oils[1].

Palm olein, a liquid fraction obtained from the refining of palm oil. Red palmolien (RPO) is obtained from crude palm oilein through a novel low-temperature process. Itis a minimally processed palmolien that naturally contains tocopherols and tocotrienols (vitamin E), and carotenoids (vitamin A) – which gives the oil its red color[2].

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Red Palmolein (RPO) & its health advantages

Red palmolein has a higher bioavailability of antioxidant nutrients than other vegetable sources and is a particularly important dietary oil for people who are not taking an excellent vitamin E supplement, with tocopherols and tocotrienols and full spectrum carotenoid nutritional supplement. It is considered as the richest natural source of carotenoids with concentrations of 700-1000ppm. That's thirty times more than is contained in carrots. The carotenoids, particularly α and β carotene are also precursors of VitaminA which is important for vision, health of mucous membranes, skin, growth of bone and reproduction. Red palmolein is the richest naturally occurring source of beta-carotene, a carotenoid that the human body can convert into usable vitamin A (retinol). Studies have shown that various carotenoids possess protective properties against certain types of cancers[3].

Disadvantages of current oil consumption

The most common edible oil used in Kerala was coconut oil, followed by palmolein and sunflower oil. The use of coconut oil for cooking was high (87%), followed by palmolien (10%) sunflower oil (2%) and 1% others[4]. When it comes to worldwide consumption of oil, palmolein ranges high when compared to other oils. The common vegetable oil in Kerala is coconut oil. The primary drawback to coconut oil is its content of saturated fat, with 11.8% saturated fat per table spoon. According to the American Heart Association saturated fat intake is one of the main causes of high cholesterol. Another disadvantage of coconut oil consumption is its high caloric density. Sunflower oil and palmolien ranges the second and third position in Kerala respectively, the controversy is that the negative effects of these oils are not been expressed clearly. Sunflower oil will cause allergy in some people, and it also seems to increase after-meal blood fats. The amount of fat that is consumed daily is a topic of controversy. Some fat is required in the diet and fat is also essential for many types of cooking[5-7].

In this scenario, we need to think about how can we use the oil in a healthy benefit way. Here comes the importance of food technology in our daily life; the use of blended oils.

Blending of oils

Blended oils or blending of oils is not new. Blending of oils means mixing of two or more oils to achieve the preset objectives. In blending composite ingredients share the advantages and disadvantages according to the blending ratio. Blending is used to produce general purpose cooking and frying oils aimed at improved and extended physical chemical and functional properties[8].

The objective of blending is to improve the functional and nutritional qualities of edible vegetable oils. The common blended oils available in the market are ''sunrich'', 'sun drop'', ''saffola' etc. The common oils used for blending are sunflower oil, rice bran oil, and coconut oil. The red palmolein can be blended with any of the three oils. Thus we can incorporate the advantages of the blended oils in red palmolein. Coconut oil is abundant with lauricacid ,a type of saturated fatty acid that will rise the HDL(good cholesterol) levels of the body, because of its high saturated fat content it is slow to oxidize, thus resistant to Rancidification. (Rancidification means decomposition of fats and other lipids by hydrolysis and/or oxidation and which makes it unsuits for cooking)[9] .

Role of CSIR-NIIST

Red palmolien is the richest naturally occurring source of beta-carotene, a carotenoid that the human body can convert into usable vitamin A (retinol). CSIR-NIIST has developed a process for the production of natural carotene and Vitamin E rich red palmolein (RPO) through the normal refining process under optimized controlled conditions so that even after refining more than 75% of the micro nutrients are retained in the product. Some years ago, a field intervention programme was carried out by CSIR-NIIST in collaboration with nutrition foundation of India and SreeChitraTirunal Institute for Medical Sciences and Technology, Trivandrum, to study the impact of vitamin A supplemented through different dosages of red palm oil and retinol palmitate on preschool children. The study provided evidence for the significant reduction of prevalence of Bitot's spots when children were given 5 mL/day RPO as a part of supplementary feeding regimen and also that RPO can be used as a source of Vitamin A to

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alleviate vitamin A Deficiency Disorder.[10-13] Thus the collaboration between the two institutions in this field is not new.

As part of 12th Five year Plan, CSIR has taken up a major program on S&T Interventions to Combat Malnutrition in Women and Children' (2012-2017). Under this initiative, CSIR-NIIST has taken up program titled ''Functional vegetable oils for addressing malnutrition due to micronutrients deficiency'. The objective of the program is to assess the acceptability of blends of RPO with commonly used vegetable oils for culinary cooking purpose as a functional vegetable oil. The study focus on the acceptability of blends; and the nutritional significance of the blended oil on the target group is not covered under the program[14-16].

Rationale for the study

The prevalence of hypercholestremia (56.2%) and other micronutrient deficiency is increased. This could be explained based on the increased oil consumption (increased consumption of fried items and nonvegeterian preparation). It is very difficult to reduce the consumption of oil in the preparation of traditional food items. So here we are trying to introduce new oil with many health benefits without alter the taste of food[17-18] .

The influence of attitudes, beliefs and opinions on food choice and purchase is especially important in the acceptance or rejection of some types of food such as organic food, genetically modified food or functional food, which are presented to the consumer as a possible alternative to conventional food. Their benefits may provide added value to consumers but cannot outweigh the sensory properties of foods. So in this scenario, we need more comprehensive understanding about the factors that decides the edible oil consumption and acceptability of new oil instead of the commonly used edible oils[19]. This study will provide the insight for the scalability and sustainable availability of the 'vegetable oil blended palm oil' consumption.

Research has already proved that vegetable oil blended palm oil can increase the Vitamin A concentration in the blood and increase the High density Lipoprotein (HDL-good cholesterol) in human blood. School level studies from Tamilnadu depicted the decreased prevalence of micro nutrient deficiencies and other related endocrine problems among the school children[20,21].

1. Objectives

Major Objective

To know the acceptability of the vegetable oil bended – Red palamolein in non-consuming areas

Specific objectives

To know the community's perceptions, beliefs and factors influencing the acceptance and choices of the various edible oils for the household consumption

To identify the factors influencing the acceptability of various vegetable oil blended palamolein in a rural community of Kerala

Methods

This study follows concurrent mixed method design. We will use both qualitative and quantitative methods simultaneously and combining both results for interpretation.

Phase 1: Qualitative phase

***Objective*:** to know the community's perceptions, beliefs and factors influencing the acceptance and choices of the various edible oils for the household consumption

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***Method of study*:** Qualitative study- Focus group discussion

***Study setting*:** Study is planned to be conducted in Pandalam Panchayat of Pathanamthitta district, Kerala. It is located in the Central Travancore.

***Rationale for choosing this study setting:* -** Medical trust diabetes care hospital - MTH (a private diabetes care hospital) had already conducted a crossectional study on prevalence of hypercholestremia (37%) in the selected study area. As a part of the study, they studied about the oil consumption pattern of the area by using qualitative methods. They have a good rapport with the community residents through various community education programmes to modify the lifestyles to prevent the early incidence of non-communicable diseases ('Know Diabetes' project). So it is easy to conduct focus group discussions among this group7 with the help of a research volunteer from the MTH and an ASHA worker (Accredited social Health Activist) from the selected community. Achutha Menon Centre for Health Science Studies (AMCHSS) already has a working partnership with this hospital through some of their projects (Project title : Impact of Type 2 Diabetes on Women's Lives and Well-being – Project as a part of Women's component plan).

Technique:

Preparatory phase: We will distribute a letter with relevant information among the randomly selected wards of PandalamPanchayath with the help of research volunteer from MTH and the ASHA workers in that particular wards. Those who are willing to involve in this discussion/ study will call the ASHA worker through phone. ASHA worker will inform the possible dates of FGDs with the potential participants. The principle investigator with the help of an ASHA worker will arrange a location for the FGD and communicate the date and venue of FGD to the potential participants. We will seek an informed consent mentioning about their willingness to involve in the study and allowing the digital recording of the FGD to those who will come to the venue of FGD. We are planning the FGD with 8-10 people from various backgrounds in the community. We will conduct 3 to 4 different FGDs in this study. The number will be more if the data saturation is not attained with 3 or 4 FGDs. We will conduct the FGDs for males and females separately. Each session will not last more than 1 hour. FGD organizer will set the focus group in a neutral location that will not affect the discussion.

***Execution phase*:** FGD will be guided by a guide. Questions will be open-ended, will allow group members good scope for discussion. The FGD guide is set up in an 'inverted funnel structure' (specific questions initially and general questions at the end). The moderator should pose questions that move from specific to general. The group will start with specific questions that address each person's likes to choose specific oil. Ending questions can be used to get the group members to summarize their opinions.

The moderator will try to keep the conversation natural. Moderator will always make sure the discussion stays broadly on-topic. This can be done by asking open-ended questions in the FGD guide. The moderator will avoid reading questions aloud and will make all questions in a natural voice.

We will record the FGD digitally by an electronic recorder and will take notes through the assistant of the moderator

Tools:

1) FGD guide with open ended questions- Questions included in the FGD Guide Should be prepared in a inverted funnel structure- (That means asking more specific questions initially and then general questions) to know their perceptions, beliefs and other factors which decides the oil consumption in the house hold.
2) Electronic digital recorder

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Phase 2: A semi randomized comparative study

***Objectives*:** To know the acceptability of the various blended oils in a rural community of Kerala

***Minor objectives*:** To identify the factors influencing the acceptability of various vegetable oil blended palmolein oil in a rural community of Kerala

***Sampling plan*:** Purposive sampling and snowball sampling
Technique: We will approach the FGD participants, who are willing to participate in the next phase of study. The consent and participant information sheet will be distributed at the end of the FGD session itself. If this sample is not adequate, we will use the snow ball sampling technique. In this, those who are known by the FGD participants or the relatives/ friends of the FGD participants will be recruited for the study after taking informed consent.

***Semi randomized study*:** Intervention group is randomized, control group is not randomized

Methods:
Step 1: At the end of FGD, we will invite the individuals with their family members for attending an educational session to know more about blending of oil, advantages of blended oil- health effects, as a cooking medium, and other things related to this, which might motivate the individuals to use that. The participants, who are willing to join for the educational session, can also invite their friends/ relatives/neighbours to this educational session.

Before starting the educational session, all the study participants will get a self- administered questionnaire to fill their sociodemographics (name, age, sex) and the average amount of oil they used for 1 month, type of oil they used for last month, (advantages of that oil) and type of food stuffs they prepared by using that oil

***Rationale for conducting the educational session*:**
Since lay people are not aware about the blending of oil, we need to explain this technical term. People will not accept food items for their household without being assured about their safety. The purpose of the session will be to motivate them to try out the vegetable oil blend in their daily use.

Content of the educational session- We will try to answer the following questions through the educational session
What is blending of oil?
What are the benefits of blending?
What are the health benefits of blended oil?
What are the disadvantages of blended oil?

Step 2: at the end of the lecture session, we

- ✓ Will distribute a leaflet containing the information on advantages of blended oils
- ✓ will ask to the individuals, for their willingness to use the blended oil at household level by giving an information sheet and consent form for the voluntary participation in the study
- ✓ Those who are willing to use the blended oil will form a group named as intervention group. We will divide the intervention group into three based on a randomization technique (lot method)
- ✓ Those who are not willing to participate in the study will form the control arm (Without control group, we cannot comment on the responses towards the Hedonic scale)
- ✓ We will maintain equal numbers in all the three groups (30 people in each group)- Total 90 people in the intervention arm and 30 people in the control arm. Since this is only an exploratory study, we are ensuring adequate numbers for descriptive patterns by admitting 30 in ach group.
- ✓ Allocation of the members into all the three intervention groups randomized by using Lot method (Distribute the lot box lots among the intervention group. The participants will take the Lot from the box)

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- ✓ These groups will receive 3 different blends
- ✓ No:1 group will get Coconut oil blended with Palmolein
- ✓ No:2 group will get Ricebran oil blended with palmolein
- ✓ No 3 group will get Sunflower oil blended with Palmolein
- ✓ Amount of oil: We will provide 2.5 litres of oil/ 4 membered family. This amount will vary according to results of FGD and mean of the average consumption of oil from the survey (step 1 of the Phase 2 study)
- ✓ All the group members will get a self-administered questionnaire to fill their socio-demographics (name, age, sex) and the average amount of oil they used for the last month, type of oil they used for last month, (advantages of that oil) and type of food stuffs they prepared by using that oil.
- ✓ Group members will get an amount of blended oil depending as the number of family members and the preparation of food using by oil on an average
- ✓ Group members are blinded about the type of blended oil they get (not know about which type of blended oil they get)
- ✓ Those who are not willing to use the blended oils, but willing to participate in the study, will join in the standard care (control group).

Tools for the study (Phase 2)

1) ***Questionnaire*** to assess the sociodemographic, present edible oil consumption- amount, type and the reasons for choosing the edible oil.

2) ***Hedonic scale*** Tool used in tasting panels where the judges indicate the extent of their like or dislike for the food. In search of valid methods of subjective measurement, Fechner (1860), who founded the science of psychophysics to study the relationship between physical stimuli and sensory responses, argued that sensory measurement could be best accomplished by measuring the subject's error in performing a discrimination task (e.g., responding to each test stimulus as ''greater than'' or ''less than'' the standard). It was not until years later that experimental psychologists, as well as consumer researchers, accepted the notion of using scaling methods, historically known as the ''method of single stimuli'' or ''method of direct scaling'', to measure sensory and hedonic responses. Many scaling methods have since been developed and have been used in a variety of situations to quantify sensation. The 9-point hedonic scale is a balanced bipolar scale around neutral at the centre with four positive and four negative categories on each side. The categories are labelled with phrases representing various degrees of affect and those labels are arranged successively to suggest a single continuum of likes and dislikes. This tool is used to know the experience/ perception of the taste of the food stuffs prepared by using blended oils as a cooking medium. This will be administered immediately after 2 weeks of oil consumption (intervention). *The characteristics of the oil, which have been used in Hedonic scale, will be developed based on the FGD findings.*

3) ***A semi structured interview schedule*****:** to know the acceptability of blended oils as cooking medium. Interview schedule will assess the factors which decide the acceptability of the oil and to know their experiences and responses after one month consumption of blended oil at household level. *This will be developed based on the results from the FGD.* This will be administered after one month of oil consumption of blended oils. ASHA worker will conduct the household visit to collect their response after 2 weeks of consumption by using a Hedonic scale and semistructued interview schedule.

4) ***Powerpont slides*** on 'awareness about blended oil and its advantages' will be used in the educational session.

Ethical considerations

Written informed consent will be obtained from all participants of FGD. Consent forms will be in Malayalam. Consent for recording will also be included.

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Separate consent form will be used for participants in the semi-randomized study. Only people who state that they are willing to be part of the study, but not willing to consume blended oil, will be used as control group. Participants stating their willingness to be part of the study as well as to try out the blended oil will be randomized into the three test groups.

Participants will have the choice of stopping participation at any time, and this will be explained to them. The total duration of participation will be noted.

Expected harm: Since all oils used for blending are already in use as edible oils, we do not expect major health hazards, especially since the use is only for a short period of one month. In case the participants experience minor health problems, a physician from the Medical Trust Hospital will be available for consultation and advice. Any participant experiencing any health problem such as allergies or gastro-intestinal distress beyond what is tolerable, during the study, will be immediately advised to stop using the blend.

Benefit from the study: The participants, including the controls, will get a free supply of oil for the month under observation. Apart from that, they will be contributing to knowledge about acceptance of blended oils.

Table 1: Tools for the study

Tools	Purpose	Phase of the study
Focus group discussion guide	To guide the FGD	Phase 1
self- administered questionnaire	to fill their socio demographics (name, age, sex) and the average amount of oil they used for 1 month, type of oil they used for last month, (advantages of that oil) and type of food stuffs they prepared by using that oil	Phase 2
A semi structured interview schedule	to know the acceptability of blended oils as cooking medium	Phase 2
Hedonic scale	To know their experience and taste perception about the food stuffs prepared by using blended oils	Phase 2
Power point slides	To do in the educational session on "awareness and advantages of blended oils"	Phase 2

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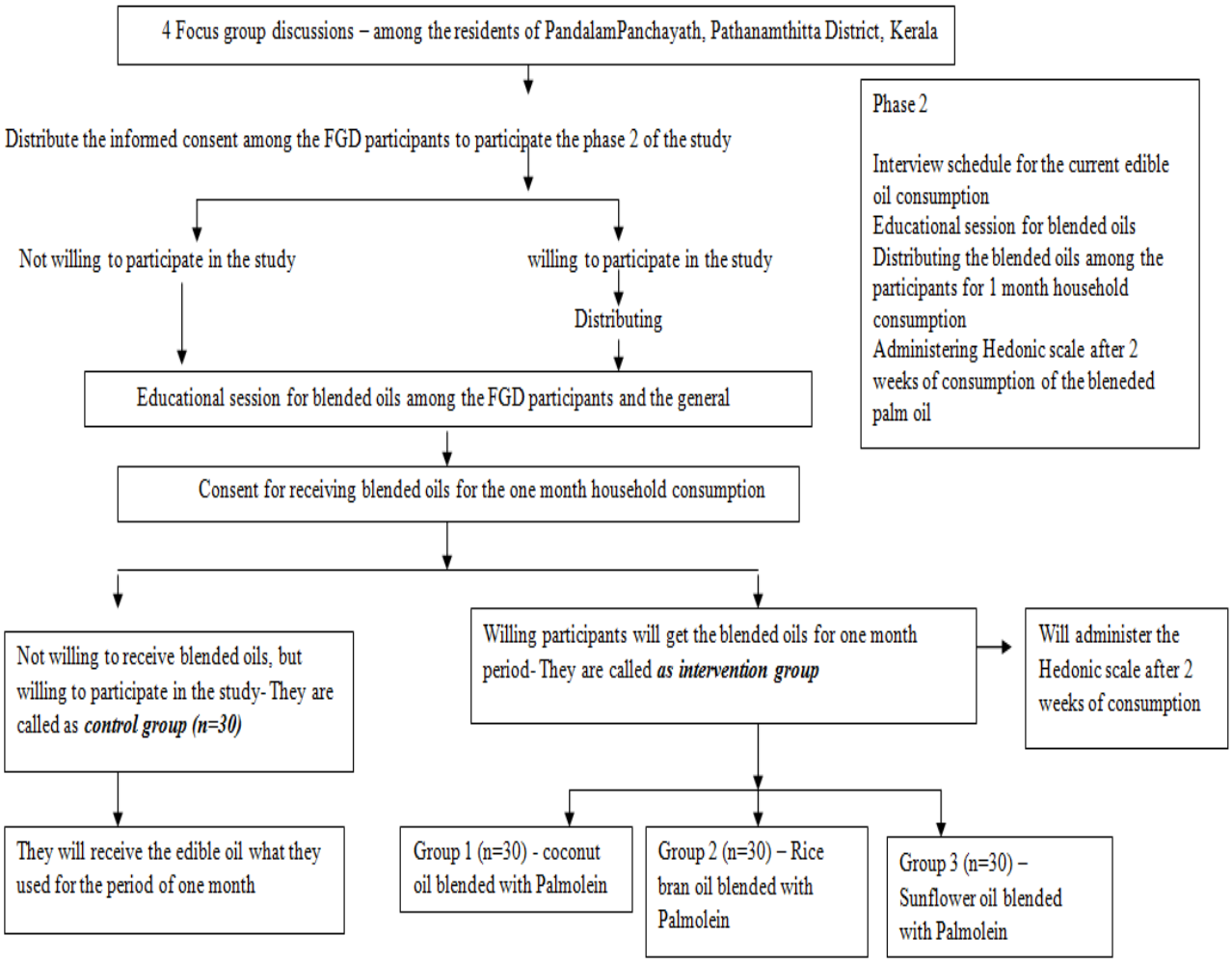

Figure 2:Flow Diagram of the Recruitment & Data collection Process

Plan for data analysis

Phase 1:
At the end of each FGD, we will transcribe the audio recordings and will code with the summarized field notes. We will identify the key broad themes and categories in the verbatim. We will review the audio recordings and annotated transcripts as a whole together, with field notes to ensure that no relevant information missed during transcription. Investigators will discuss the coded data and refine them in an iterative process after discussion. We will cluster the codes at the end, and it help to emerge the key themes. The qualitative data will analyses through N-VIVO software

Phase 2:
We will check the significant difference between the groups by one-way ANOVA, using the R statistical package (R Core Team (2015). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria.URL http://www.R-project.org/). Data will also be represented graphically.

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Project management

a. Staffing and work plan- Research study will be co-ordinated by the principal investigator and the project assistants. The focus group discussions will be done by the field staff recruited for the research, assisted by the investigators. Investigator will select the ASHA worker from the selected panchayath for the recruitment of potential participants in the FGD and the crossectional survey. PI will assure the practical knowledge and skill of ASHA worker and the project assistants. Project assistant will do the data entry. Principle investigator and the co-investigator will solely the responsibility of project management.

b. Plan for dissemination- Information obtained from the study will be used to write the scientific manuscripts aiming publication in International and national peer reviewed journals and also for oral and poster presentations in international, national and other relevant conferences and meeting.

c. Data storage and transfer and management- Data management is the responsibility of the PI and the data will be accessible only to the PI and the co-investigator. Data in hard and soft forms will be compiled and stored for future reference and will be used as and when required.

Funding sources

Council of Scientific and Industrial Research - National Institute For Interdisciplinary Science & Technology (CSIR-NIIST), Trivandrum, Kerala

Conflict of interest: nil

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