III Methodology

The methodology adopted for the present study entitled "**Effect of Food Safety Intervention on Safe Handling Practices among food handlers and Microbial assays of processed food products from Fruits and Vegetables Industries"** was drafted to accomplish the specific objectives of the study and consisted the following phases.

Phase I: -Identification of food handlers and collection of data from the selected food handlers of fruits and vegetables industries.

Phase II:-Formulation of tools to conduct descriptive survey and to validate nutrition education modules for the training program.

Phase III: Microbiological assays of the selected food products.

Phase IV:- Pre and Post assessment of preparing on sanitation and safe taking care of practices based on (HACCP) and (GHP) using (KAP Overview) and

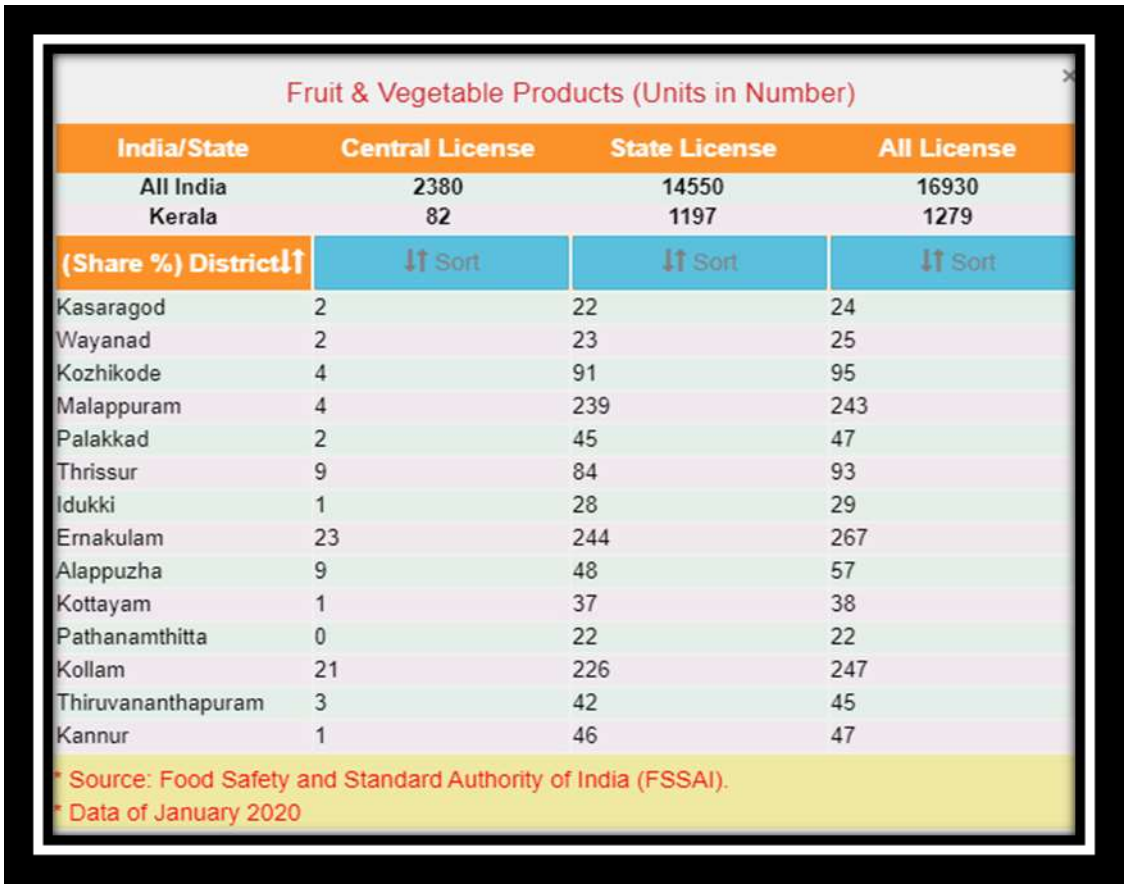
Phase V:-Statistical analysis and interpretation of data.

Phase I: -Identification of food handlers and collection of data from the selected food handlers of fruits and vegetables industries

The food handling area is probably the greatest business in India as far as creation, circulation, commodity, utilization and anticipated development. This area really comprises of many kinds of areas like oat, beats (grain) handling, meat, poultry and fish industry, milk and milk item enterprises, leafy foods handling, pressed drinking water, etc. It likewise incorporates limited scope businesses like pickles, chutneys, bread, candy parlour, ground and handled flavours, improved nuts, oilseeds and natural products consolidated treats, etc. In some food enterprises, products are exceptionally short-lived and need to have additional consideration to forestall waste or decay during produce taking care of from the makers to the last retailers. Great food taking care of practices assisted with accomplishing food handling and security. With this backgrounds, the current review was done in the accompanying phases.

3.1 Selection of fruits and vegetables processing industries.

The present study was conducted in fruits and vegetables industries located in Meenangadi , Manjeri, and Waynad and were ice cream factories, bakeries, jam, jelly, ketchup, pickles, squashes and beverages production units.



Fruit & Vegetable Products (Units in Number)

India/State	Central License	State License	All License
All India	2380	14550	16930
Kerala	82	1197	1279
(Share %) District	Sort	Sort	Sort
Kasaragod	2	22	24
Wayanad	2	23	25
Kozhikode	4	91	95
Malappuram	4	239	243
Palakkad	2	45	47
Thrissur	9	84	93
Idukki	1	28	29
Ernakulam	23	244	267
Alappuzha	9	48	57
Kottayam	1	37	38
Pathanamthitta	0	22	22
Kollam	21	226	247
Thiruvananthapuram	3	42	45
Kannur	1	46	47

* Source: Food Safety and Standard Authority of India (FSSAI).
* Data of January 2020

Fig 1: Fruit and vegetable products producing units in Kerala

Kerala has 82 Central FSSAI License and 1197 State FSSAI License Fruit and Vegetable Processing Units with the total of 1279 fruits and vegetables production units in Kerala state. Among 1279 production units, three productions which has many brands and branches in the study region were chosen for the current exploration study.

The major fruits and vegetables cultivated in Kerala were jack fruit, banana, coconut, mango, guava, papaya, lemon, gooseberry, passion fruit, custard apple, tamarind, okra, onion, tomato, green chili, bitter gourd, radish cucumber, pumpkin, brinjal, beans, cabbage and cauliflower. Brief profile of the selected three famous vegetables

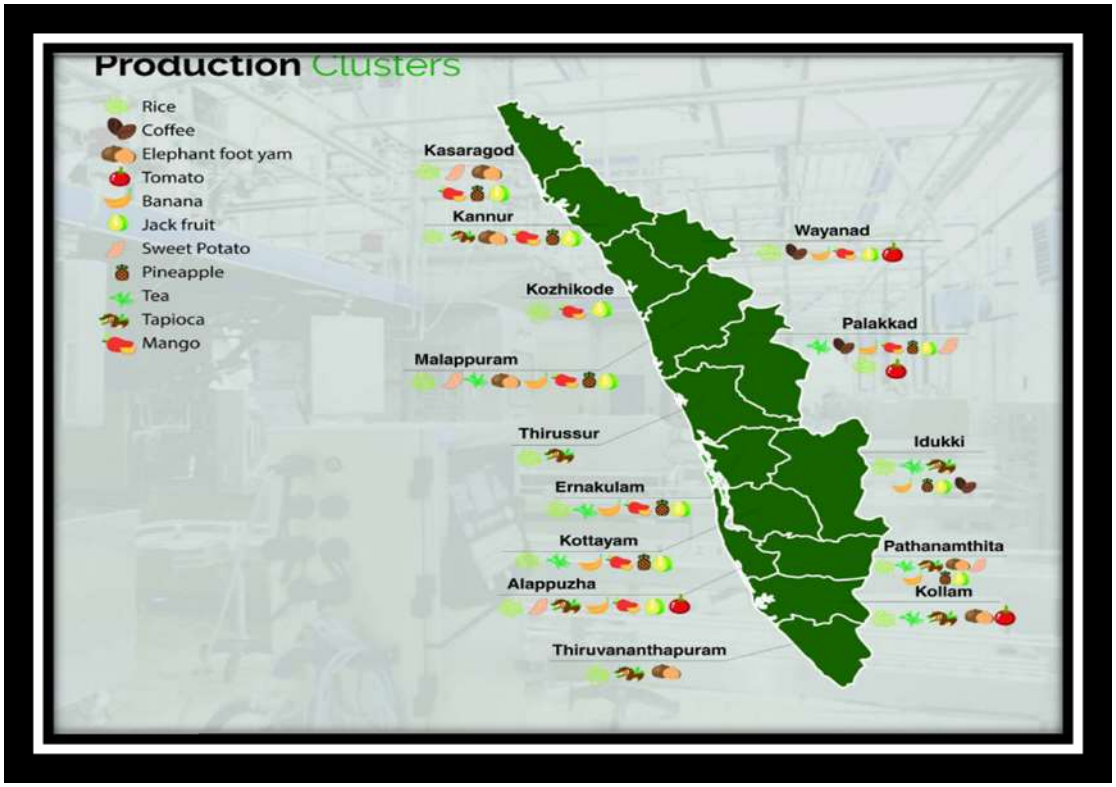
and fruits industries and have many branches in the selected study area is discussed in the following para.

I. “Anna Foods” now a market leader with innovation as the tagline and kicked off in Meenangadi and spreaded in many parts of Kerala State. Anna food products captured the market with its seller brand “Fizzy with an array of 70 different flavours in ice cream variety. The overwhelming responses from customers and distributors for their different varieties of products urged to enter a novel arena of innovation and creativity to generate an offshoot of jackfruit production units which turns out more than 10 specialized jackfruit products, jam, squash, ice cream, jack chilly, jack pepper pickle, jack coffee, jack puttupodi, jack appetizer, jack chutney, jack sweets and savoury items. This company has its operational units in north –eastern part of Kerala State.

II. Panda Foods (India) Pvt Ltd. is one of the key players in the food industry segments in Kerala state. This Panda food industry has a basket of products including spice powder, blended masala powder for both vegetarian and non - vegetarian recipes, jams, pickles, dried vegetables and fruits powder and fortified health mix.

III. Olene Canto is offering healthy, “Fast People’s Bakes” without having artificial colours, artificial taste enhancers, animal fats, and additives and chemical preservatives. Products of olene canto included bakery items and dehydrated fruits and vegetables powder and fresh fruit juices. In these three fruits and vegetables processing industries, skilled and unskilled employees were engaged for effective processing of food production.

In these three industries, number of skilled and non-skilled employees were comparatively high and management permitted to conduct study in their industries. In this Research, Purposive Sampling technique was adopted and executed with the support of Food Safety Officers of the selected study area of Kerala State.



Source: Ministry of Food Processing of India (2019-2020)

Fig 2: Production clusters situated in Kerala State

3.2 Selection of subjects

The test is a subset or piece of the complete populace (Singh, 2011). Inspecting is done as the method involved with finding out with regards to a populace based on the example drawn from it (Gupta, 2013). An agent test is a little gathering of the universe from which results can be drawn and is a common sense strategy to lead an examination (Kothari, 2014). Purposive inspecting method was embraced to direct the study. The all out number of representatives working in the three significant products of the soil were 509. Anna Food varieties had 182 representatives working in three distinct units, Panda had 206 workers working in four unique units while Olene had 121 representatives working in three diverse units.

Sample size

$$\text{Unlimited population: } n = \frac{z^2 \times \hat{p}(1-\hat{p})}{\varepsilon^2}$$

$$\text{Finite population: } n' = \frac{n}{1+\frac{z^2 \times \hat{p}(1-\hat{p})}{\varepsilon^2 N}}$$

n = N*X/(X + N – 1), where, X = Zα/22 *p*(1-p)/MOE2, and Zα/2 is the basic worth of the Ordinary dissemination at α/2 (for example for a certainty level of 95%, α is 0.05 and the basic worth is 1.96), MOE is the room for mistakes, p is the example extent, and N is the populace size. Certainty Level is 95%, Peripheral Mistake 5%, populace extent is half, Populace Size is 509 and test size determined was 220. Purposive testing strategy was taken on to choose 20 extremely durable food overseers from every 10 sub units (n=200). These food ventures were essentially handling natural product based items, for example, frozen yogurts, bread kitchen items and organic product jelly like pickles, jams and ketchups.

Based on the inclusion and exclusion criteria. A sample size of 200 food handlers were identified and considered for collection of data.The study was conducted in 10 sub units of the selected three major vegetables and fruits industries. 20 permanent employees were derived from each industry in the age gathering of 20-50 years with at least essential level education.

Ethical Clearance Approval was obtained from the Institutional Human Ethics Committee of Avinashilingam Institute for Home Science and Higher Education for Women. Coimbatore before proceeding with the research study. The approval number is AUW/IHEC/FSN-19-20/XPD/32 and the certificate is enclosed in Annexure I.

Inclusion Criteria	Exclusion Criteria
Fruits and Vegetables processing industries where fruits and vegetables were incorporated in their food products	Cereal, pulses, milk and milk products, poultry, oil seeds, nuts, sugar based processing industries
Permission granted to conduct research in the Processed fruits and vegetables	Not granted permission to conduct research in the processed fruits and

industries.	vegetables industries.
Permanent staff in industries were considered for the research study.	Temporary or daily wages in industries were not considered for the research study.
Willing and cooperative food handlers ready to participate with written consent	Not willing and non –cooperative food handlers, not interested to participate in the study
Literates and able to write and read	Illiterates and not able to write and read

Descriptive and cross sectional research survey was carried out to gather data related to demographic profile such as, age, sex education and occupation profile and their basic knowledge identified with food handling , cleanliness and safe taking care of practices of the selected subjects after getting the permission from the administrer of the selected industries. This research is more concerned with what rather than how or why something has happened. Therefore observation and survey tools were used to gather data. A total of 200 food handlers employed in fruits and vegetables industries were selected for the study. The selected food handlers were motivated for their self improvement by attending food safety and sanitation seminars,training, workshop and so on to enhance their knowledge and ideas and also professional skills by participated in the competitions.

Jack Fruit Ice Cream

Bakery/Chips/Fruit Cake

Pickles/ Jams/ Squash **Green Chilli/Tender Coconut Ice Cream**

Fig 3: Fruits and Vegetables Industries selected for the present study.

Phase II: Formulation of tools to conduct descriptive survey and evaluate nutrition education modules for the training program.

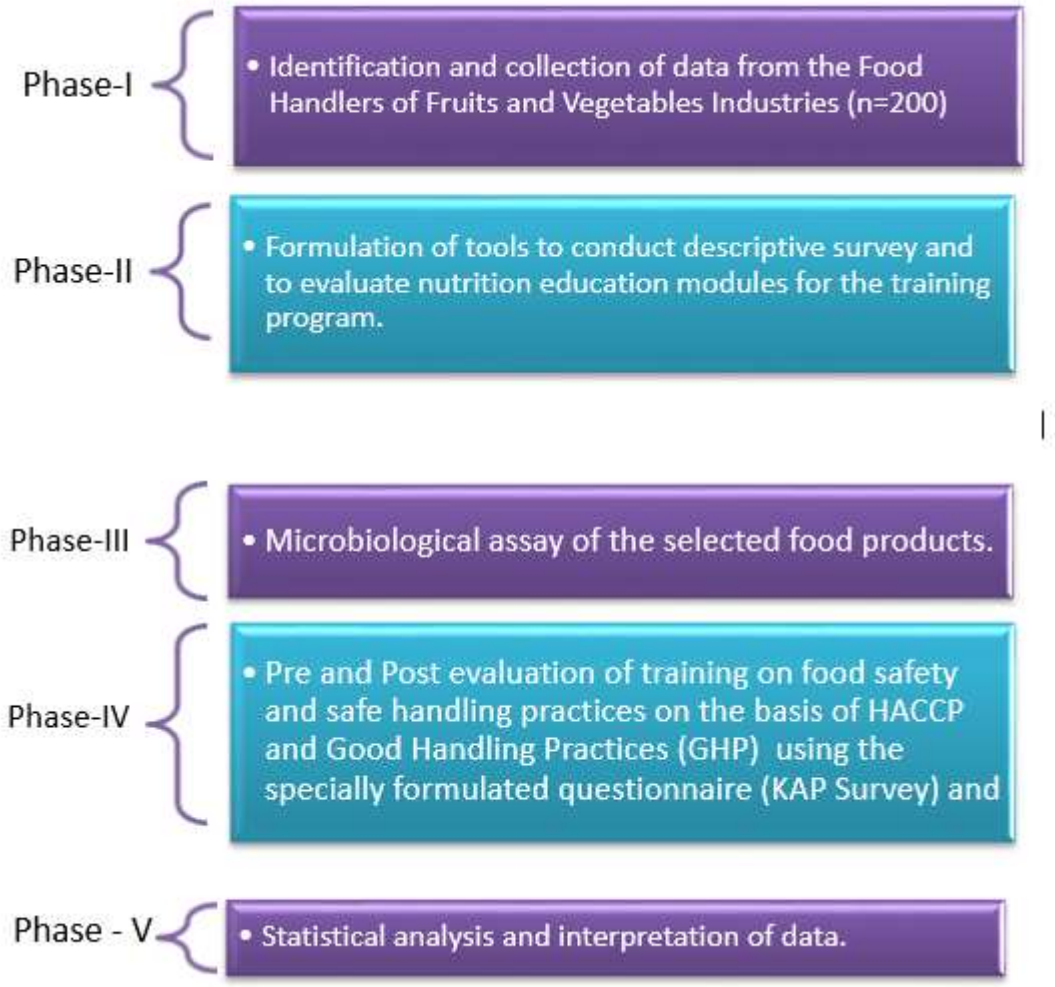
A questionnaire is a bunch of composed inquiries for respondents to address. These answers become essential information for examination. Concurring to Kumar (2019) "a survey is a composed report posting a progression of inquiries relating to the issue under study, to which the agent requires the appropriate responses". Questionnaire are regularly utilized as an instrument in overviews for the essential information assortment instruments.

Interview as the method of data collection provides ample opportunity to interact with the selected subjects and offers benefit of collecting additional information by personal observation. Kothari (2014) stated that interview method is suitable to collect required data and to record information systematically. The scope of clarification of any ambiguous data is possible in the interview method. For the formulation of tools to conduct survey, a centre gathering conversation was done among the chose food overseers and their higher authorities to follow the significant regions to be focussed for the food handling preparing as far as information poll and information on rehearses survey and food handling and safe dealing with rehearses. Legitimacy and dependability of the defined devices were tried with senior gifted and untalented food overseers and furthermore converted into the nearby basic language of Malayalam and English. The segment profile identified with the foundation data like age, sex, instruction, occupation status, long stretches of involvement with food taking care of, month to month pay and furthermore the past openness to preparing

on Sanitation, etc were assembled utilizing fitting tools. Questionnaire on knowledge related to food safety and safe handling practices consisted of 10 to 15 questions related to the sub area of food preparation, personal hygiene, food services, food storage facilities available and so on was developed to know about their awareness in these aspects. The knowledge scores and knowledge of practices scores were categorised as the selected subjects were aware or not aware of these aspects included in the questionnaire.

Information related to the infrastructural facilities available in the selected vegetables and fruits processing industries were gathered in terms of storage –refrigeration, freezer units for food preparation and handling practices , washing and disposal of waste products , pest control , sanitary facilities and equipment , employees facilities, personal practices , construction , water supply and plumbing , safety testing laboratory to assess the quality and quantity of products developed in the selected industries. Sanitation problems in the establishments were identified and considered to take necessary action for proper maintenance of sanitation and safe handling practices including personal hygiene. These aspects were also considered for training intervention and effectiveness was assessed using the specially designed questionnaire. Questionnaire for data collection is given in Annexure I

Fig.4: Schematic representation of the study



Phase III: Microbiological assay of the selected food products

In the investigations of (Kim .et.al 2010), the Basic Control Focuses (CCPs) for weakening of the nature of food was recognized as coliform tainting from the hands of the food overseers and this was decreased definitely , when the food controllers used to clean up systematically.

The detection and enumeration of microorganisms in food is an important component in ensuring the safety of foods. Microbiological analysis of foods is effective in monitoring the contamination and analysing trends for detecting emerging risks. Microbiological examination of food varieties depends on the identification of microorganisms in food sources by quantitative or enumerative strategies just as

subjective techniques otherwise called presence/nonappearance tests. Conventional culture techniques for recognizing microorganisms in food sources depend on the consolidation of the food test into a supplement medium in which the microorganisms can increase, consequently giving visual affirmation of their growth. The encompassing is polluted with a spread of miniature living beings got from different sources. Assessment of the quantities of bacterium (Vigorous Settlement Count, E.coli) will give accommodating data once evaluating general cleanliness. Ecological recognition can even be utilized as a piece of routine assessments of food premises or in partner degree examination of a speculated food contamination normal occasion any place surfaces square measure thought to be apparently vehicles of cross pollution (Chandi and Patra, 2012).

Total Plate Count is the most broadly utilized strategy for deciding the quantity of feasible cells or State Framing Units (CFU) in a swab test. Assessment of E .coli is a significant piece of microbiological examination of food varieties for quality affirmation. On the off chance that present in food, it doesn't generally influence the taste, smell, or presence of the food. Coliforms are a gathering of microscopic organisms utilized to survey the microbiological nature of water or potentially food. The presence of coliform microbes in prepared to-eat food sources demonstrates unhygienic conditions during handling, taking care of and dispersion or post handling tainting (Nemati.et.al 2016).

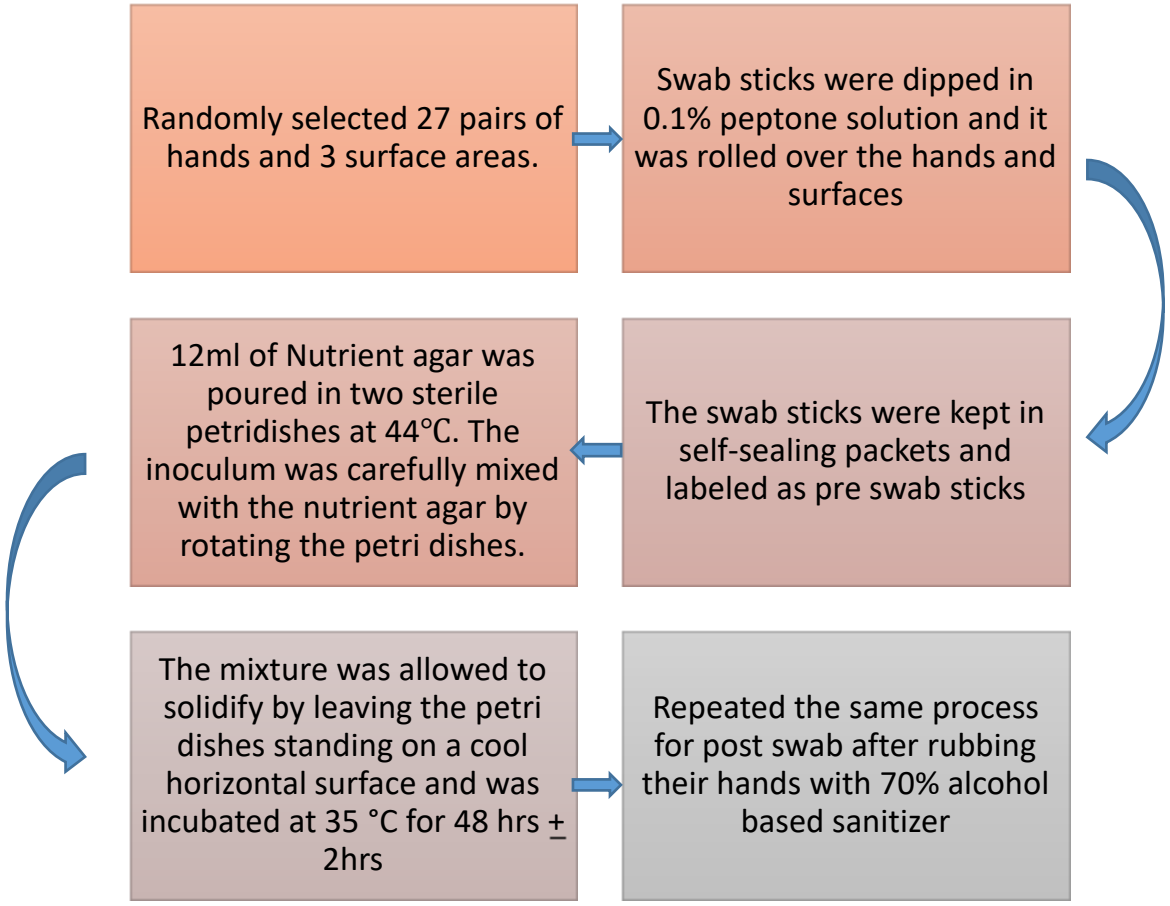
(Collins 2000) expressed that the palms and skin overlap in the middle of the fingers of the chose physiotherapists were cleaned with sterile sticks plunged into 2 ml of clean ordinary saline, preceding and after hand cleanliness rehearses, separately. The swabs were vaccinated on MacConkey agar (Oxide) plates and refined by the pour-plate strategy. After short-term brooding at 37°C, the plates were inspected for microbial development and any noticeable settlements were counted and first read infinitesimally for morphological elements (shading, size, shape, edge, rise, haemolysis on blood agar, regardless of whether there was lactose maturing on MacConkey agar, and colour creation on Mannitol salt agar). At the point when at least three settlement shaping units (CFU) were found on a plate, the organic entity was viewed as a bacterial foreign substance. Further distinguishing proof of organic entities was done after they were sub refined on new supplement agar. Bacterial disengages were distinguished dependent on pioneer morphology, Gram stain, and a

battery of biochemical tests including catalase, coagulase, oxidase, in give, Voges-Proskauer, and motility tests. All the research centre techniques were done as portrayed by Collins and Lyne (2000). With this view, swab tests for evaluating hand and surface region cleanliness were done and are examined in the accompanying pages.

1. Pre Swab Test of hands and surface area of the processing units.

Microbial contamination in processing units can occur from the food handlers, the equipment's and surfaces of the establishment. Swabs are an effective tool in the detection of such contamination. Food handlers, work surfaces and equipments used in the processing unit may cause cross contamination. Pre swab test was done as a surprise check to find out that the selected food handlers had washed their hands properly before starting their work. Hands swabs were collected from food handlers (n=27) who had included in the present study and answered the questionnaire properly. Pre Swab Test was done using alkaline peptone water, nutrient agar, sterile distilled water and cotton swab only for 27 workers who were permitted by the administrator. The cotton swab was dipped 0.1% peptone solution and rolled over the hands. The swab sticks were kept in self-sealing packets and labeled. Twelve ml of Nutrient agar was poured in two sterile petridishes at 44℃. The inoculum was painstakingly blended in with the supplement medium by turning the petri dishes. The combination was permitted to harden by leaving the petri dishes remaining on a cool even surface and was hatched at 35 °C for 48 h + 2 h.

Fig.5: Schematic representation of Swab Test



2. Post Swab Test of hands and surface areas

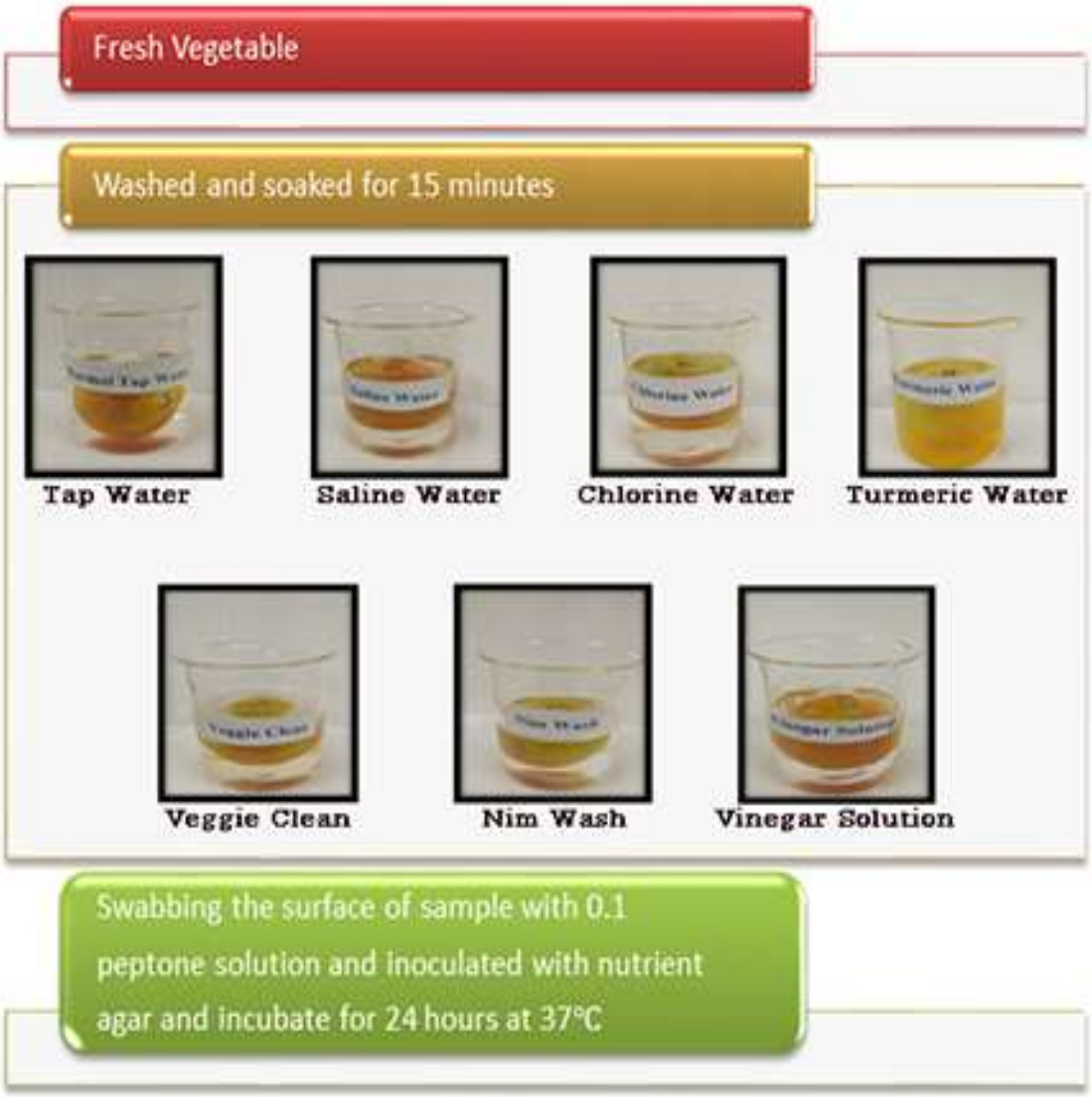
Alcohol has a fantastic germicidal action against gram positive and gram negative vegetative microscopic organisms and an assortment of growths. Quantitative examinations on the impacts of clean hand rubs have set up that liquor successfully lessen bacterial depends on hands. Post Swab test was done after pouring and scouring their hands and surfaces with 70% liquor based sanitizer. Q-tip was plunged 0.1% peptone arrangement and turned over again on the hands. The swab sticks were kept in self - fixing parcels and named. An aggregate of 30 Pre and 30 Post Swab tests (27pairs of hand and 3 surface region) were gathered from the food handlers, equipment and machineries and considered for post swab tests. The pre and post swab plates were vaccinated with supplement agar and was brooded at 35℃ and measurably analysed.

3. Microbiological Assays of food products

Amoah et.al (2007) found that washing in consumable water followed by dunking in 20% vinegar for 15 minutes was the best sanitization strategy in a study.

As the cases of food-borne outbreaks were alarming and it became important for knowing the preventive measures of food-borne illness. Washing fruits and vegetables was the best way to reduce the risks of occurring the food-borne illness. In this present study, the procedure for proper washing with the natural and commercial fruit and vegetable cleaners was investigated to find out the effectiveness of the cleaning agents commonly used in the industries and to decide the all-out bacterial burden on the outer layer of the products of the soil by utilizing seven diverse washing arrangements like ordinary regular water, 0.1 ml chlorine, 2gm saline, 1 ml vinegar, 1gm turmeric arrangement and two ordinarily utilized business washes specifically 2ml Nim wash and 0.5ml Veggie clean which were utilized for washing cleaning purposes. The leafy foods were washed and absorbed the individual answers for 15 minutes. The outer layer of the tomato was cleaned with 0.1 peptone arrangement and was hatched for 24 hours at 37 ℃ with supplement agar. The parts of Nim *wash* are citrus natural product concentrate and neem which are assisted with eliminating the microorganisms. Then again, veggie clean is made out of Sodium Chloride, Sodium Cocoyl Glutamate, Lauryl Glucoside, Potassium sorbate, EDTA and Citrus extract which assisted with eliminating the pesticides and germs.

Fig.6: Cleansing solutions used for washing of vegetable (Tomato)



4. Shelf life of selected fruits and vegetables processed products

When put away as indicated by the suggested conditions, the food item should hold its own substance, physical, microbiological, and sensorial qualities and, where relevant, consent to any mark affirmation of dietary data (Man, 2012).

With the permission of the authorities of the selected processing industries, three processed food products like jam, pickle, and sauce were collected to carry out the shelf life study for 1st Day, seventh Day, fourteenth Day and 30th Day. The shelf life study was carried out in term of the parameters such as appearance, pH, acidity,

moisture, total bacterial count and total fungal count, and to know the best before date fit and suitable for human consumption.

4.1 Determination of the pH

To determine the pH by electrometric method.

STANDARDS:

- The pH of the standard solution should be 4, 7 and 10.

PROCEDURE:

Instrument Calibration:

- Calibrate the pH meter with the buffer solutions of the required pH
- If the pH meter value and the pH of the buffer solution didn't match each other, adjust the pH meter to show the value matching with that of the buffer.

pH Measurements:

- Remove, clean and dry the electrode after calibration.
- Take aliquot of sample in a beaker and measure the pH directly with the pH meter.
- After measurement remove, clean and dry the electrode, and deep it in storage solution.

Reference: FSSAI/BIS

4.2 Determination of Acidity

I. Materials:

Phenolphthalein indicator, Burette, Burette clamp and stand, Weighing balance, Graduated cylinder, Beakers, Conical flask and 0.005N NaOH solution.

Procedure:

1. Take 1gm sample into a 250 ml tapered flask
2. Add 100 ml of Distilled water.
3. Add 3 to 4 drops of Phenolphthalein indicator
4. Titrate the sample with 0.005 N NaOH
5. In end point, record the milliliters of NaOH used.

6. Calculate the acidity using the following formula:

% acidity = ml of NaOH used x Normality of NaOH x milliequivalent factor x 100

Weight of sample in gm

Reference: FSSAI/AOAC 18th Edition

4.3 Determination of moisture:

- Weigh accurately about 2-5 gm of sample in a tarred aluminum dish.
- Dry in an air oven at 100 ±2° C for 5 to 6 hours. Cool in desiccator and weigh. Dry again for 30 minutes and cool in a desiccator and weigh.
- Repeat the process of heating and cooling in a desiccator until the difference in two successive weighing is less than 1 mg.
- Record the lowest weight. Carry out the determination in duplicate.

Calculation:

$$\text{Moisture (\%)} = \frac{(W1 - W2)}{(W1 - W)} \times 100$$

Where, W = Weight in gms of Aluminum dish. W1 = Weight in gms, of Aluminum dish + sample before drying. W2 = Weight in gms, of Aluminum dish + dried sample.

Ref: FSSAI/AOAC

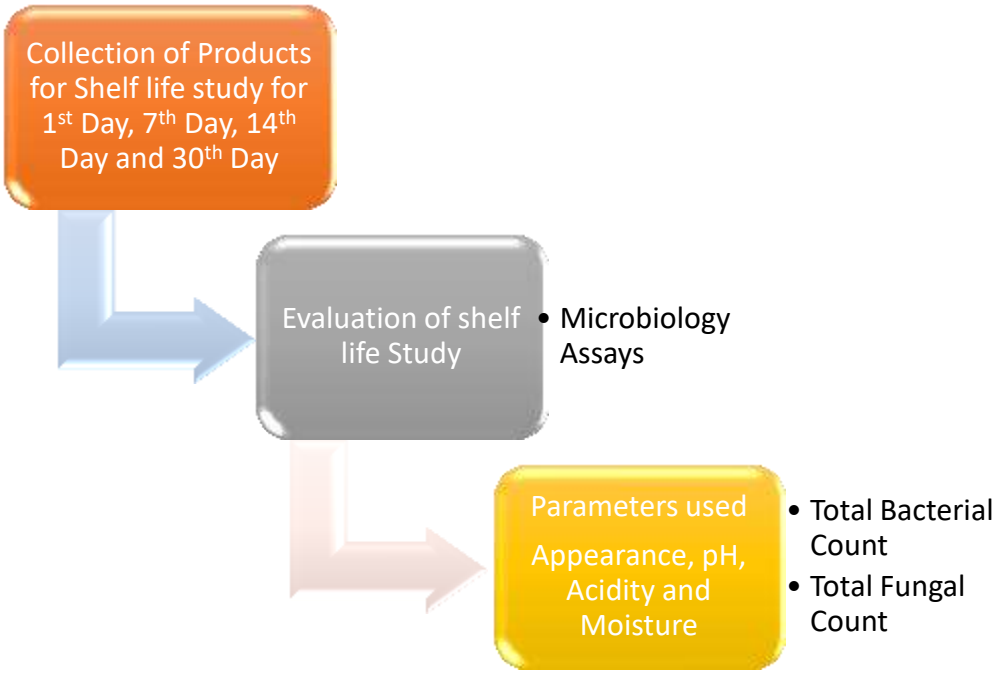
4.4 Total Bacterial Count

Total bacterial not really settled by colony count method for the specification of microorganisms, by including the states filling in a strong medium after vigorous hatching at 35 °C. Nutrient agar was poured in two sterile petri dishes at 44℃. The inoculum was painstakingly blended in with the supplement medium by turning the petri dishes. The combination was permitted to set by leaving the petri dishes remaining on a cool even surface and was brooded at 35 °C for 48 h + 2 h. Spreading settlements will be considered as single provinces. On the off chance that short of what one-fourth of the dish is congested by spreading count the states on the unaffected piece of the dish, work out the relating number of the whole dish. In the event that more than one-fourth of the dish is congested by spreading dispose of the count.

4.5. Total Fungal Count

Total parasitic include for practical contagious include in items planned for human utilization was controlled through the settlement count method at 25°C. Two sterile Petri dishes was taken and 1 ml of test was moved to each dish, through a sterile pipette. 15 ml of the Chloramphenicol Yeast Glucose Agar at 45 °+ 1°C was filled each petri dish. The inoculum was blended cautiously with the medium by pivoting the petri dishes. The combination was permitted to set by leaving the petri dishes remaining on a cool flat surface. The pre-arranged dishes were upset and brooded at 25 °C +1 °C for third, fourth and fifth days count the states on each plate after third, 4th and fifth long periods of hatching. The settlements were counted utilizing state counter after required incubation. Plates containing less than, 150 provinces were utilized for counting colonies.

Fig.7: Schematic representation of Shelf Life Study



Phase IV: Pre and Post evaluation of training on Food Safety and safe handling practices on the basis of HACCP and GHP (Good Handling Practices)

"The first step towards change is Awareness.
The second step is acceptance for Implementation"

This guidance training is primarily focused on certain important basic principles and practices that are strongly associated with reducing microbial counts and food safety hazards from the field to distribution for consumption. Good handling practices are required to reduce or control microbial contamination of fresh food produce.

Food handler hygiene and sanitation practices are critical in minimizing or controlling microbial contamination in all aspects of food processing.
In food businesses , an extraordinary accentuation is given on sanitation , safe taking care of practices and cleanliness as a little occurrence of food defilement , harming, etc. can prompt serious results and furthermore showed that there was no adherences to food cleanliness and wellbeing rehearses. It very well may be because of absence of sanitation mindfulness among the food controllers and brought about high microbial burdens. Subsequently there is a need to teach food overseers on great sterile practices/great taking care of practices would likewise the use of HACCP in Indian setting is conceivable yield the ideal consequences of working on the security of food and safe dealing with practices.

Regular training and monitoring play an important role in assuring food safety in food industries. It helps the employees to imbibe the basic hygiene practices in their day to day work and also maintain good standard of hygiene (Yadav .et .al 2015).

With this backdrop, a food safety and hygiene training program for the period of six months was carried out to enhance the knowledge of the food handlers for the effective and desirable transformation in individual's personal and professional life. A total of 200 food handlers involved in fruits and vegetables industries were considered as the target group of the Phase IV. Training program focused in imparting awareness about food safety hygiene and safe handling practices among the selected food handlers.

During this training program, the educational modules, based on objectives were distributed to the selected subjects. The researcher selected visual aids to support the training program. The electronic visual aids –Microsoft power point for one hour with appropriate literature and pictures were developed for educating the target group of population and it enhances the presenter's credibility, persuasion with increased audience interest, attention and also helps to retain the key points with the suitable pictures. Booklets and pamphlet were developed were developed and distributed to the target subjects. All the visual aids were prepared in the simple language of Malayalam and English, in which the beneficiaries easily understand the facts related to food safety and hygiene and safe handling practices.

Evaluation was done to measure the degree of success of the training program. The pre and post - test questionnaire were framed for assessing the effect of training program. The pre- test questionnaires was distributed before the commencement of training program on KAP. After collecting the filled pre- test questionnaire from the food handlers, training program was executed for six months. After the training program the post- test questionnaire was administered and recorded.

Pre evaluation was conducted on the basis of the Hazard Analysis and Critical Control Point (HACCP) and Good Handling Practice (GHP) using specially designed questionnaire and interview schedule related to personal hygiene, good handling practices, food safety and HACCP to access the knowledge of the food handlers using specially designed a questionnaire. Observational approach was also adopted to assess the hygienic practices of food handlers and hygiene conditions of the selected processing units. Observation might be characterized as the orderly review of a particular wonder in the appropriate setting for the particular motivation behind social occasion information for a specific study (Kothari, 2014). The Hazard Analysis and Critical Control Point (HACCP) concept is a systematic approach for the identification, assessment and control of hazards. The system offers a rational approach to the control of microbiological hazards in foods. Hazard analysis consists of an evaluation of all procedures concerned with the production, distribution and use of raw materials and food products.

A Critical Control Point (CCP) is an activity (practice, method, area or interaction) at which control can be practiced more than at least one variables to kill, forestall or limit a hazard The hazard analysis includes observation and inspection in the processing area determines the critical points and identify any hazards of biological, physical and chemical aspects which might be altered the quality and quantity of food products and it might be proven to be injurious to an individual's health. The quality and quantity raw materials were carefully monitored as it would spoil the end products and consumption of this food products which causes food borne illness. The work flow was monitored in terms of the product lifecycle management from the beginning of formulation till the end product development. Packing and storage conditions were also monitored and included in the data collection.

Fig 8 : Inspection and observation in the Food Industries

Nutrition pedagogy can be characterized as any arrangement of learning encounters intended to work with the wilful reception of nourishment and wellbeing - related practices helpful for advance wellbeing and prosperity. It is a vital piece of providing nutrition services to food overseers. The objective of sustenance schooling is to support explicit nourishment related pursues or practices to change routines that add to chronic weakness. This was finished by making a motivation for change among food overseers to set up advantageous food handling rehearses for advancement and protection of great wellbeing to work on the individual cleanliness and taking care of procedures of the food controllers, a sanitation instructive module was developed.

The topics covered for the training food safety, cross contamination, HACCP, good handling practices, food borne illness and personal hygiene with suitable examples and relevant life experiences. Nutrition education modules such as booklets,

manuals, book, power-point presentations and posters were developed and used for the training program for the period of six month.

Food safety remains a critical issue in the food sector and the mishandling of food plays a significant role in the occurrence of food borne illness. Food handler's training is one strategy food safety can be increased by offering long term benefits to the food industry **(**Smith, 1994). Training refers to the systematic development of knowledge, skills and attitudes required to perform a task effectively. It helps to modify attitude, knowledge and behaviour. A food safety training programme was conducted to educate the food handlers for the period of six months. The effect of training was assessed using the specially designed questionnaire highlighting KAP.

Fig 9: Selected Processed Food Industries used for training.

Training methods are strategies used by trainers to convey information so that learners can obtain learning outcomes defined by research objectives. One or more training methods can be used in a presentation. It is best to use various methods to keep subjects engaged throughout the training programme, such as lectures, presentations, group discussions and so on. The lecture is mainly an oral presentation, but it can be supplemented by visual aids or presentation presentations. This is probably the most common training method because it is easy to organize, can display a huge measure of material in a moderately brief timeframe, and is reasonable for little or huge learners. The lecture involves the transmission of information in one direction from the trainer to the learner (Barkley.et.al 2020).

The presentation should be explained verbally along with visual or tactile activities. The method demonstration showed the process, concepts, and facts. These are

effective in teaching observable skills. In results demonstration of certain practices or innovations, such as disinfecting water or cleaning products were used for washing vegetables and fruits. A presentation involved a combination of methods and proof of results, and also included hands-on activities by participants. It is important to strengthen learning by providing subjects with visual or tactile activities to gain knowledge in the training programme. KAP surveys was conducted to collect information about general topics and/or specific population knowledge (known knowledge), attitudes (that is, thought content), and practices (that is, completed content).

The training program lasted for six months. Before organizing the training of food practitioners, it is necessary to obtain prior permission from the food processing department. The training was conducted in 20 batches and collected data were carefully consolidated. A team leader was appointed, who generally implies food safety principles in the processing unit. The activities of the processing unit were monitored in terms of sorting or selecting high-quality fruits and vegetables, washing and storing properly, checking for pest infestation, garbage disposal, waste management, disinfection and cleaning of the surface and the surrounding environment.

Regular observation and training had been given to the food handlers. In post evaluation phase, the knowledge, attitude, practices of the food handlers had was assessed using the specially designed questionnaire and interview schedule with reference to the significance of training personal hygiene, meals safety, HACCP and good dealing with practices and mentioning, the consequence of working towards unhygienic sanitary conditions and measures to overcome the problems of contaminations, extending the shelf existence of the products

.(Gil.et.al2015).Some activities were also organized forthe food handlers like listing out the foremost motives of food borne diseases, circle the bizarre one out, quizzes, debates and group discussions (Malavi,2017). With these evidences, the food safety intervention was executed effectively and collected data were statistically analysed.

Fig 10: Activities conducted for the food handlers

Phase V:-Statistical Analysis and interpretation of data.

KAP scores were statistically associated with socioeconomic profile, indicating the need for training programmes on good practises to consider these factors. The effectiveness of training programmes on knowledge acquisition must be considered, as they are important in changing food handlers' attitudes, practises, and understanding of their key role in food preparation, distribution, and consumer consumption for their health and wellness.

The last phase of the study was based on the tabulation of the collected data for statistical analysis and interpretation. The responses were tabulated into seven main headings like Food safety, Hazard Analysis Critical Control Point, Cross contamination of foods, Good handling practices, Personal hygiene, Infrastructure Facilities and disposal of waste and Packaging, labelling and transportation. The results of pre hand and post swabs, microbial assessment and shelf life study were tabulated and statistically analyzed using an IBM SPSS statistics SPSS version 23.Pearson’s coefficient correlation was used to determine the degree of linear relationship between two variables ‘t’ test were used to evaluate the impact of the food safety education cum training programme. Descriptive statistics such as means and percentages were used to describe the data. The data thus obtained were tabulated, analysed and interpreted. The results depicted the level of understanding and also assess the knowledge, attitude and practices of the food handlers regarding food safety, sanitation, hygiene and safe handling practices. Independent tests, t test was applied in broke down the critical contrasts between the aftereffects of self-

revealed practices of the food taking care of and the microbiological cleanliness evaluation.

Fig : 11 Overall Schematic Diagram