

V Summary and Conclusion

Food wellbeing and safe dealing with rehearses have taken on a more noteworthy importance in ensuring general wellbeing as the food business has become bigger, more united and more different, and new dangers have seemed to raise for extraordinary concern. These concerns have increased the requirement for food controllers to understand the pivotal pertinence of sanitation and clean principles, just as how to accomplish and keep up with safe taking care of practices in food industries. Food hygiene is the condition that to guarantee the safety of food from creation to utilization. Food controllers assume a vital part in guaranteeing food handling and counteraction of food contamination, food cross defilement, etc. for advancement of wellbeing and prosperity of the populace. These regions are canvassed in the current examination study to instil the protected dealing with rehearses among the chose food handlers.

The present study entitled “**Effect of Food Safety Intervention on Safe Handling Practices among the food handlers and Microbial assays of processed foods from Fruits and Vegetables Industries**” Good Cleanliness Practices plan to carry out the fundamental standards of food cleanliness pertinent all through the natural wonder (counting essential creation through to a definitive buyer), to understand the objective of ensuring that food is protected and fitting for human consumption.

With this background the current study was conducted focussing the objectives of

- Identification of food handlers and collection of data related to demographic profile, food safety, personal hygiene, infrastructure facilities available, sanitation and record keeping from the selected fruits and vegetables industries.
- Assess the safety of food handling practices among food handlers using specially designed questionnaire.
- Microbial assay of the selected fruits and processed foods from fruits and vegetables industries.
- Development and validation of safe food handling education modules for training intervention and

- Implementation and evaluation of effect of training intervention on Knowledge, Attitude and Practices (KAP) of food handlers from fruits and vegetables industries

The present study was carried out in Kerala. 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. Purposive sampling technique was adopted to conduct the study. A sample size of 200 food handlers were identified and considered for collection of data. The focus of the study was on Fruits and Vegetables processing Industries in terms of ice cream factories, bakeries, jam, jelly, ketchup, pickles, squashes and beverages. Good food handling practices helped to achieve food safety and security.

The present study was carried out in the following phases:

In **Phase I** sampling and identification of food handlers was carried out done to collect data and pre evaluation was conducted on the basis of HACCP and GHP using specially designed questionnaire. To assess the knowledge of the food handler's interview schedule related to personal hygiene, good handling practices food safety and HACCP. 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 raw materials were closely monitored as it would spoil the end product and consumption of this food products which cause food borne illness. The work flow was monitored from the beginning of formulation till the end product development. Proper packing and storage conditions were also monitored. Data gathered were documented in results and discussion.

In **Phase II** of the research study Nutrition education modules such as booklets, manuals, books, power-point presentations and posters were developed and validated for Food Safety training and safe handling practices for the period of six months.

In **Phase III** Microbiological assays of the selected fruits and food products were carried out by swab tests. Pre swab test was done as a surprise check to find out that the selected food handlers had washed their hands before starting their work. The

pre Swab Test was done using alkaline peptone water, nutrient agar, sterile distilled water and cotton swab. 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 for microbial assay. Post Swab test was done after pouring and rubbing their hands, surfaces with 70% alcohol based sanitizer. The cotton swab was dipped 0.1% peptone solution and rolled over again on the hands. The swab sticks were kept in self-sealing packets and labeled for further analysis. A total of 60 Pre and Post Swab samples were gathered from the food controllers and chose workspaces of the industries. The pre and post swab plates were inoculated with nutrient agar and was incubated at 35°C to determine the Total Bacterial Count.

A test was likewise done to decide the complete bacterial burden on the outer layer of the products of the soil by washing the leafy foods in various washing arrangements like ordinary faucet water, chlorine, saline, vinegar, turmeric arrangement and two business washes of Nim wash and Veggie clean. The products of the soil were washed and doused for 15 minutes to lessen the bacterial burden successfully after in the separate solutions. The parts of Nim wash are citrus organic product concentrate and neem which assisted with eliminating the microbes. Then again the synthetic equation 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 microorganisms, in this way diminishing the all-out bacterial count from 80cfu/g to 9 cfu/g.

With the authorization of the specialists of the chose handling businesses, Timeframe of realistic usability study was additionally directed for jam, pickle and sauce for first Day, seventh Day, fourteenth Day and 30th Day. The timeframe of realistic usability study was completed for assessing boundaries of appearance, pH, sharpness, dampness, all out bacterial count and all out contagious count and to know the best before date fit and reasonable for human utilization. Absolute bacterial not really settled by Horizontal strategy for the list of microorganisms, by including the provinces filling in a strong medium after oxygen consuming brooding at 35 °C.

In **Phase IV**, Food safety and safe handling practices training intervention was executed for the period of six month the knowledge, attitude, practices of the food

handlers was assessed using the same questionnaire and interview schedule with reference to the importance of practicing personal hygiene, food safety, HACCP and good handling practices and mentioning, the consequence of practicing unhygienic sanitary conditions and measures to overcome the problems of cross contaminations, extending the shelf life of the products, proper packing and maintaining the storage temperatures. An evaluation study was carried out to find out the effectiveness of the training intervention on KAP on Food Safety and safe handling practices among the selected food handlers.

In **Phase V** of the study was based on the tabulation of the collected data. The responses were tabulated into five main headings like Food safety, Infrastructure and Facilities, Maintenance and Sanitation, Personal hygiene and Food borne illness and Training and Record keeping. The results of pre and post swabs, microbial contamination, and shelf life study had been tabulated. The data was analyzed and graphically represented according to the latest version of SPSS version 23 and also using relevant statistical tools.

The salient findings of the study are given in the following paragraphs

➤ **Demographic Profile of the selected Food Handlers**

- Food Handlers were selected from fruits and vegetables industries in the age group of 20-50 years for the current research study. Out of 200 selected food handlers, a total of 123 (nearly 62 percent) were males and 77(39 percent) were females, employed in these ten sub units. This showed that more of male food handlers employed the food industry expressed that they had travelled from one place to another easily by their own or public transports for multitasks of the industries. Female food handlers were mainly employed for the purpose of cleaning and preliminary preparation of foods inside the industries. By observation, it was noted that the selected female food handlers had more culinary skills and adopted safe practices than male employees.
- Out of 200 food handlers.53 percent of the food handlers were in the middle adulthood (30-40 years) and rest of them were in the age groups of 20-30 years and 41-50 years.

- Sixty seven percent of the food handlers were married. This indicated that there was an urge to work and earn money among the food handlers to meet their livelihood. It also showed that 10 percent of the selected food handlers were divorced while nine percent were widow and denoted that they were self-dependent to meet their daily expense and lived an economically stable life and rest of them were unmarried.
- It is heartwarming to note that only eight percent of the selected food handlers did not receive any formal education, and were illiterate and not able to read and write. Nineteen percent of the food handlers had primary level of education whereas 28 percent had education at secondary school level. Nearly forty five percent of the selected food handlers had an opportunity to receive higher education including post-graduation level at colleges and universities level.
- Work experience of the food handlers in the field of food processing was expressed that 22.5 percent of the food handlers had of 10-12 years of work experience in their field. As their advance in age, their experience also increases and their skills and outcome of their work were appreciated. As the education level was low they could not shift over to any other field of occupation. Most of the selected food handlers remained and continued the legacy of their work.
- Forty one percent of the selected food handlers were assigned the processing responsibility which included selection of raw materials, grading, sorting, all preliminary preparations which included the washing, peeling, chopping and cooking the fruits and vegetables. Fourteen percent of the selected food handlers were involved in cleaning and sanitizing the processing unit. Six percent of the selected food handlers were selected as the quality controller or the quality assurance manager as they had experience in the field of food safety, quality and safe handling practices. Nearly 18 percent of the food handlers' especially female food handlers were in charge of the packaging as the food handlers were allocated the responsibility to measure the required quantity and pack appropriately according to the requirements. Eleven percent of the selected food handlers were allocated the responsibility of storekeeping

or taking care of the commodities in the huge godown and also responsible for store keeping and to maintain accurate stock update of the raw materials procured, used and the balance leftover in the account. The storekeeper had a list of assured wholesale dealers and suppliers from where the raw materials procured. Ten percent of the selected food handlers were in the dispatch department where the prepared food products were packed and labelled properly and were transported to the market. Meagre percent of the males were drivers to deliver the processed products to various wholesale, retail shops and supermarkets.

- Monthly income of the selected food handlers revealed that the income of the food handlers depends on the educational qualification and years of experience in food processing. It was found that around 42 percent of the food handlers earned a monthly income ranging between Rs.5000/- to 10,000/-. Only six percent of the food handlers working as Quality Controller in their food industries and had monthly income more than Rs.20,000/-. It may fluctuate from one spot to another contingent upon the kind of food industry location, educational qualification and work experience. Nearly 22 percent of the food handlers earned less than Rs 5000/- and were engaged in the activities of cleaning and washing.

➤ **Microbial Assays of selected processed food products**

- Various solutions were utilized to clean leafy foods to limit the quantum of microbes and pesticides from the outer layer of the chose products of the soil, with faucet water, chlorine, saline, vinegar, turmeric, Nim wash and veggie clean. The all out bacterial count before wash of the tomato was 80cfu/g, while the all out bacterial count after wash utilizing faucet water was 55cfu/g, chlorine 22cfu/g, saline 21cfu/g, vinegar 18cfu/g, turmeric 14cfu/g, Nim wash which is a business wash was 14cfu/g and veggie clean was 9 cfu/g. The previously mentioned washes are gentle surfactants which helped in lessening the all-out bacterial count from 80cfu/g to 9 cfu/g. Around 88.75% of microorganisms were eliminated subsequent to washing with veggie clean. Introductory mean of the tomato was 80, $SD \pm 2.79$, while the last mean of the tomato was 21.85, $SD \pm 14.15$. The t test esteem was 11.4040. The two followed $p < 0.0001$ which is viewed as incredibly genuinely significant.

- Thirty pre swab tests were gathered from the hands of the food handlers. Total bacterial count was found on the hands of greater part of the food overseers. The pre mean TBC was 502.33 SD \pm 118.03.
 - Thirty post swab tests were gathered from the hands of the food overseers. Complete bacterial count was observed to be less on the hands of the greater part of the food controllers when contrasted with the pre swab test after appropriate washing with cleanser and utilizing liquor based sanitizer. The post mean TBC was 102 SD \pm 29.59. The t an incentive for Complete Bacterial count was $t=18.0198$ with a $p < 0.0001$ which is viewed as amazingly measurably huge, though the t an incentive for which is viewed as genuinely critical in the decrease of microbial counts.
 - A gradual increase in the total bacterial count was observed over the period of one month. Initially “nil” report was noted in jam and sauce whereas it was around 85×10^1 cfu/g for pickle. After one month the total bacterial count was 25cfu/g and 18cfu/g respectively for jam and sauce. Whereas the total bacterial count for Pickle doubled itself within one month. This showed that the label of the products which denoted that the products will last long for 6 months actually got spoiled within one month. Even though the appearance was good for all the products even after one month. This meant that the products were not suitable for human consumption after one month storage. The total fungal count over the past one month. Initially it was 5cfu/g for jam, 4cfu/g sauce whereas it was around 9 cfu/g for pickle. After one month the total fungal count was 15cfu/g and 12cfu/g respectively for jam and sauce. Whereas the total fungal count was 50cfu/g within one month. This showed that the label of the products which denoted that the products will last long for six months actually got spoiled within one month and needed to have suitable storage area.
- **Knowledge of food handlers with regard to food safety**
- It was noted that prior to the training 36 percent food handlers had knew that food poisoning was cause due to the presence of microorganisms present in the food. Whereas after undergoing training, there was an increase in the knowledge level of fifty seven percent regarding the microbes which were

responsible for the spoilage of food. Around forty seven percent of the food handlers strongly believed that consumption of uncooked, raw foods and improper techniques employed during processing was harmful for the human health and after undergoing the training it rose till 67 percent. An awareness was created among 50 percent of the food handlers after the intervention programme that poor washing of fruits and vegetables are major risk factors for food poisoning. It was clearly seen in 48 percent food handlers that they had become more cautious regarding the quality of food as well as the temperatures at which they are stored. Eight two percent of the food handlers responded that the perishable food items should be mandatory kept at low temperatures in the refrigerators so as to ensure the shelf life of these perishable food products. The training brought about a change in their safe handling practices it was observed that around 64 percent of the food handlers strongly agreed that unhygienic and dirty hands can lead to food borne illness thus active hand washing for 20 seconds was implemented before touching fruits and vegetables with bare hands. A significant change was observed among the food handlers who underwent the training as 84 percent strongly responded that healthy food handlers assume a significant part in keeping up with food quality and amount and furthermore fit for human consumption.

➤ **Attitude of food handlers with regard to food safety**

- It was noticed that the preparation enormously affected the mentality food handlers towards food safety as 74 percent of them felt that safe food handling was their sole responsibility and priority to safeguard the health of the consumers. Sixty six person responded that this training was a refresher course as they had an opportunity to enhance as well as upgrade and polish their knowledge as learning relearning and unlearning a continuous process. After gaining knowledge on the proper storage conditions 83 percent of the food handlers practiced and followed strict storage condition principles in the deep freezers and refrigerators. As the concept of cross contamination was discussed with the food handlers. Sixty nine percent of the food handlers practised keeping the raw and uncooked food away from the processed food products. The training also improved their hand hygiene practices as 74 percent of the handlers regularly washed their hands as working with unclean

hands can be a source of food borne diseases. It was interesting to note that 73 percent of the food handlers emphasized in washing and cleaning of fruits and vegetables with good cleaning agents which would eradicate all the harmful microorganisms and thus it will help in maintaining the quality and quantity of the food products. As the knowledge of the food handlers had increased it also played an important role in maintaining good personal regimen in 82 percent of food handlers. The knowledge of cross contamination from surface to surface brought a significant change as 42 percent of the food handlers used separate chopping and cutting boards for fruits and vegetables. As food safety became the first priority for every food handler it was seen that around 89 percent of the them had periodic medical check -up in order to their promote goodness and wellbeing and become healthy and diseases free and fit for professional satisfaction.

➤ **Practices of food handlers with regard to food safety**

- The practices of food overseers with respect to food handling food controllers was noticed that the preparation enormously affected the food handlers as it was observed that around 79 percent of the food handlers used gloves while handling food products. Around eight four percent of the food handlers practiced to use good quality cleaning agents while washing their hands every time they come in contact with dirty surfaces.74 percent of the food handlers were not allowed to work near the processing area if the food handler was suffering from any skin infection and gastro intestinal problems as the infection may get transmitted and it may contaminate the food. Personal hygiene became a part and parcel of their lives. Eight four percent of the food handlers responded that they were not allowed inside the processing units if their hands were untied. They had to wear a head gear or a cap to prevent the hair from falling into the food while processing. The nails were supposed to be always cleaned and trimmed to eradicate the germs. Ninety six percent of the food handlers adopted good and safe handling practices in regard to washing the fruits and vegetables before processing. Nearly 78 percent of the selected food handlers used appropriate containers and packaging materials to store the food contents. The selection of packaging materials depended up to the

food products, quantity, shelf life, transportation and distribution in order to prevent spillage and wastage of food commodities.

➤ **Knowledge of food handlers with regard to HACCP**

- . It was noted that prior to the training only 28 percent of the selected food handlers were aware of the importance of HACCP in food industries. Fifty six percent of the food handlers agreed that qualified staff who are trained in HACCP is required in the food industry in order to identify any hazards which may occur at any stage of processing. Forty nine percent of the food handlers learnt about the various types of hazards which could hamper the safety and quality of the products, Fifty two percent of the food handlers responded that all the steps involved should be recorded and monitored carefully to identify and control the hazards from occurring again. It was noted by 62 percent of food handlers that regular training is very necessary to upgrade and it helps to maintain safety and ensuring cleanliness in and around the processing unit. The training created an awareness regarding the good manufacturing practices which decrease the risk of contamination and enhancing the quality of food products. Fifty one percent of the food handlers responded that their industries received the HACCP certification as they were following the correct principles as well as evaluating and monitoring the possible hazards which might take place in the food industry while processing.

➤ **Attitudes of food handlers with regard to HACCP**

- Around 82 percent agreed that physical, chemical and biological hazards contaminate the food and cause deleterious effects on the health of the consumers. Sixty six percent of the food handlers responded that to identify any hazards skills and expertise is required so every food handler should undergone at least the basic level HACCP training so that the hazards can be identified and be eliminated before spoil the end product and also agreed that The food handlers if they strictly follow the correct time, pH and temperature they can prevent the growth of microbiological hazards in food. Sixty two percent of the selected food handlers expressed that observation and monitoring of possible hazards can be properly identified through continuous

inspection and adopting preventive strategies. Nearly fifty seven percent of the food handlers responded that acceptable limits should be set in for time and temperature to identify the causative agents which become hazardous in due course of time. Sixty seven percent of the food handlers strongly believed that proper documentation and record keeping should be maintained for the smooth conduct of the processing for effective outcome of their industries. Record of time, temperature, equipments, hazards identity, preventive measures taken to control and eliminate the causative agents leading to contamination of physical, chemical and biological hazards which can be eradicate by properly monitoring and identification by food handlers who are trained in this field, Thus giving as assurance that the food products are manufactured and processed in a safe and good sanitary conditions.

➤ **Practices of food handlers with regard to HACCP**

- Nearly sixty two percent of the food handlers responded that to identify any hazards the food handlers needed to work as a team, it is the responsibility and priority of each food handler to report any incidence of hazards at each step of processing in order to safeguard the quality and safety of the processed foods. As the food handlers attended the training their knowledge was enhanced any they became aware that microorganisms are the basic causative agents in contamination of food as responded by 49 percent of the selected food handlers. It was found that 51 percent of the food handlers knew that chemical hazards or metal toxicants present in food, if ingested in the body can leading to chronic food borne illness whereas 62 percent of food handlers responded that physical hazards are physical components of a food that cause illness to the human consumption of foods and the food handlers understood the importance of hazard analysis critical control point in the food industry.

➤ **Knowledge of food handlers with regard to cross contamination of food products**

- Nearly 72 percent of the food handlers had attained knowledge on proper hand washing before handling fruits and vegetables in order to eradicate the germs from getting in the food. Eight two percent of the selected food handled

responded that germs and bacteria easily spread from raw to ready to eat foods because raw are very perishable in nature. Microorganisms can multiply rapidly and may spoil the food. According to 68 percent of food handlers. Storage conditions like proper time and temperature should be maintained to prevent cross contamination. Eight two percent of the food handlers gained knowledge regarding usage of different containers for different foods while handling various food commodities. It was pointed out by eight one percent of the food handlers used clean water and cleansing agents which are useful in preventing food borne illness and the major sources of transmission are raw foods, people, animals, hands cloths , equipment and all contact surfaces.

➤ **Attitude of food handlers with regard to cross contamination of food product**

- Nearly seventy one percent of the food handlers pointed out well cooked foods are free of contamination only they are stored properly away from raw and cooked foods at suitable time and temperature. Seventy four percent of the food handlers also understood the importance of maintaining proper hand hygiene to eradicate and prevent illness caused by cross contamination. Around sixty two percent of the food handlers had responded that the raw foods should be kept separate and covered in different containers so that transmission of cross contamination could be hampered. Around 69 percent of the food handlers also pointed out that the storage conditions as well as deep freezers and refrigerators should be cleaned periodically to stop or eliminate cross contamination from its surfaces to food. Around 82 percent of the selected food handlers also pointed they avoided opening the doors of the refrigerators as it will cause fluctuations in the temperatures and ultimately spoil the products and food handlers who had any kind of skin infections were also not allowed to touch any food items without wearing gloves.

➤ **Practices of food handlers with regard to cross contamination of food product**

- Nearly seventy two percent of the food handlers did not store the frosted foods as the change in temperature and texture of the food from solid state to semi solid and then into liquid stages and vice versa change create favourable conditions for the growth of microorganisms. It was seen that 82 percent of the

food handlers washed and sanitized work areas, knives, utensils, used dish cloth and the chopping boards properly to prevent all possibilities of cross contamination from these surfaces to the foods which are been processed. As the knowledge level of the food handlers had increased it was also reflected into their working style. Seventy eight percent of the food handlers used to sort and store raw and fresh food commodities in the bottom shelves away from cooked foods to ensure the safety of food products. Around 68 percent of the food handlers were medically examined for their employment to assess their health status and to know about their physically and mentally fit for the job. Nearly seventy four percent of the food handlers responded that the use of masks, gloves, caps as well as not wearing finger rings and watches also helped to forestall the event of cross defilement in the food products. The knowledge and awareness created among the food handlers produced a sense of responsibility among 84 percent of food handlers and also agreed that good and safe handling practice along with personal hygiene became a crucial part in the prevention of cross contamination in foods.

➤ **Knowledge of food handlers with regard to good handling practices**

- Seventy eight percent of the food handlers agreed that poor quality of water or non- portable water are the potential source of transmitting microorganisms into the food. Regular water testing are been checked for quality of water by BIS labs to detect the presence of microorganism and metal contaminants which can lead to food poisoning. Around 58 percent of the food handlers strictly followed good handling practices which helped to minimize or control of microbial contamination from water. The portal and non- portable water were marked with green colour and red colour so that good quality water could only be used for processing. It was also interesting to know that food handlers paid more attention their health and personal hygiene regime to ensure the safety of the consumable fresh produces. Fifty four percent of the food handlers used warm water to wash their hands as it was more effective destroy microorganisms. Around sixty eight percent of food handlers thoroughly scrubbing, rinsing and drying of the hands were considered very important in good handling practices while working in the food industry, Hence hand washing stations were installed at various places along with hand driers so

that the food handlers avoid using the same towel. Ninety percent of the food industries maintained the toilets and rest room in an excellent manner equipped with proper facilities like soap, water, hand driers napkins, exhaust fans, proper ventilation and lighting and dustbins.

➤ **Attitude of food handlers with regard to good handling practices**

- Around 78 percent of the food handlers responded that all shoppers reserve the privilege to expect safe, cleanly ready and great quality food. Nearly sixty nine of the food handlers responded that it requires good care while handling food in order to prevent hazards. Nearly seventy nine percent of the food handlers believed that good handling practices were a set of guidelines to prevent contamination in foods. Seventy six percent of the food handlers followed good handling practices which included keeping the work areas and its premises neat and clean. Transportation also had an important role in transporting safe, good quality food products in good sanitary conditions. Eighty one percent of the selected food handlers focussed on cleaning, sanitation and maintenance along with personal hygiene of the food handlers played an important role in implementing good handling practices.

➤ **Practices of food handlers with regard to good handling practices**

- Seventy six percent of food handlers considered training as one of the most important aspect of good handling practices. Seventy two percent of the food handlers responded that they were motivated and also promoted and given incentives if they practice good handling practices while preparation, packaging, storage and transportation as it ensures the safety and suitability of food at all stages of food chain. Seventy nine percent of the food handlers also mentioned that good handling practices are critical to protect customer's wellbeing and notoriety of food business.

➤ **Knowledge of food handlers with regard to personal hygiene**

- . It was observed that 76 percent of the food handlers washed and dried their hands thoroughly and frequently during handling foods as dirty hands becomes the cause factor in transmitting germs into the food. Fifty four percent of the food handlers responded that the selected food handlers were not allowed to smoke, chew gums, spitting and eating while working in the food industry. Eighty eight percent of the food handlers were supposed to be in their

aprons, covers and gloves to forestall cross tainting of foods. Seventy eight percent of food handlers get their valuables such as watches, rings, mobile phones, purses in the locker room as they were not allowed to wear these accessories in the processing area. Around 58 percent of the female food handlers had to tie their hands and were asked to trim their nail and keep it neat without nail paint as it may chip off while working in the processing unit. Eighty two percent of the food handlers were so cautious that they used water proof bandages to evade the infection caused by burns, boils and cuts. Nearly seventy four percent of the food handlers frequently washed their hands after using the washrooms, blowing nose, disposing garbage etc. The sick person was not allowed near the processing area because there was a risk of the transmitting the germs and infection while they sneeze and cough. Hence it was advisable to stay at home and re-join duty after recovery.

➤ **Attitude of food handlers with regard to personal hygiene**

- Seventy eight percent of the food controllers concurred that food overseers could defiled food. At the point when they didn't keep up with and follow great individual cleanliness really direct contact with food while processing. Sixty eight percent of the food handlers understood the importance of good health without any ailments in order to ensure safety and good shelf life of food handlers. Seventy eight percent of the food handlers used all the protective accessories like gloves, masks, head caps, shoe covers and aprons so that cross contamination does not occur due to sweat and germs on the body. An awareness was created among sixty eight percent of food handlers regarding food borne illness and use of safe portable water while processing. Regular health checks with vaccinations play a very important role in preventing various life threatening health issues. Periodic training should be conducted for food handlers as it would help to update their knowledge regarding the importance of practicing personal hygiene.

➤ **Practices of food handlers with regard to personal hygiene**

- It was an integral part to have a bath every day before entering the processing unit as fifty one percent of the food handlers practiced personal hygiene regime strictly in order to evade skin allergy and infections. Sixty four percent of the food handlers pointed that they had to remove finger rings and were

required to trim the nails in order to prevent contamination and preventing physical hazards which may hamper the safety and quality of the foods processed. Seventy three percent of the food handlers laid importance on sanitation and maintenance in the food industries. According to sixty two percent of the selected food handlers each processing unit should be inspected by well -trained health and food safety officers for the smooth functioning of the food industry. As a part of personal hygiene practices forty eight percent of food handlers were provided first aid treatment in order to protect and safeguard any emergencies occurring in the food industries. Proper preparing ought to be led for the food overseers to keep them redesigned with the most recent data about food handling and individual cleanliness practices.

➤ **Knowledge of food handlers with regard to infrastructural facilities**

- Around 78% of the food overseers reacted that all the handling and capacity regions to be kept perfect and clean as the residue and soil will defile the food products prompting deterioration and wastage of food. The floors of the handling region ought to likewise be kept spotless and dry to forestall falls and accidents. Water should not be allowed to stagnant in and around the processing making thus making it dirty and muddy while coming in and going out. Sixty three percent of the food handlers responded that the waste products should be disposed off quickly and frequently in order to evade the breeding of mosquitoes which may linger around the processing areas and contaminate the food commodities. Regular sweeping, dusting and mopping, is required to keep away the dust and cobwebs in the processing unit. Nearly forty eight percent of the food handlers cleaned the cleared the drainage in order to prevent any blockages caused by washing and cleaning fruits and vegetables. Around sixty three percent of food handlers insisted on the use of dustbins with a lid in order to prevent flies, mosquitoes while processing of food and is easy to dispose the waste frequently. As the food handlers are expected to maintain personal hygiene and practice cleanliness in and around the processing unit soap, napkins, hand driers, drinking water should be made available for the food handlers in an adequate amount for a hassle free functioning of the processing unit.

➤ **Attitude of food handlers with regard to infrastructural facilities**

- Nearly seventy one percent of the food handlers responded that food handlers need to practice healthy habits for a safe environment in order to produce good quality food products. Seventy seven of the food handlers also agreed that the work area should be clean and tidy for fosters production as well profits of the food industries. Fifty six percent of the food handlers were well trained and skilled in handling food commodities in a safe and hygienic manner with proper uniform and protective clothing in form of masks, head caps, gloves and shoe covers. Nearly 78 percent of the food handlers followed the standard operational procedures for the efficient functioning and maintenance of the equipments. Nearly 68 percent of the food handlers responded that proper lighting and ventilation is important for effective production of food products so the pests can be inspected and identified and eliminated from the premises.

➤ **Practices of food handlers with regard to infrastructural facilities**

- Seventy two percent of the selected food handlers responded that infrastructural facilities have a direct impact on the safety of food as clean and tidy sanitary ensures the quality of food. Forty nine percent of the food handlers responded that pest infestation and cleaning agents should be kept closed and away from the processing areas as it may contaminate the good if incidence of pest infestation and chemical toxicants are found. Fifty two percent of the food handlers responded that the internal design, structure, plan and equipments should be well planned so that it is easy for the food handlers to work without any hurdles and the output is productive. Around forty nine percent of the food handlers emphasised on the cleaning of air filters and exhaust fans so that the circulation of air and ventilation is well maintained. The drainage system should be well constructed and cleaned regularly to remove the contaminants and the drainage water is flows freely which would help in removing off smell and odours. Sixty five percent of the selected food handlers responded that it was important to keep the cold storage and deep freezers clean and away from dirt in order to prevent cross contamination, separate areas should be allocated to store raw and processed food products. Pallets should be placed in order to store huge amount raw materials and it

keeps them protects from rodents and moisture providing stability to the commodities. Sixty three percent of the food handlers laid stress on improving the sanitary conditions of vans. The refrigerated vans should monitor the temperature as it transports the perishable food products from the industries for distribution and marketing to the whole sale and retail market. The vans should be well painted in order to remove rusting of the doors and footrest. Mechanical damage is also prevented if the processed foods are packed and transported properly.

➤ **Knowledge of food handlers with regard to packaging, labelling and transportation**

- According to sixty four percent of the food handlers emphasized on the importance of appropriate packaging as it protects the food contents from getting spoiled, damaged and contaminated with the presence of pest infestations. Nearly forty six percent of the food handlers stated that packaging labels should contain all the important nutrition information about processed product. There are several packaging materials available market such as paper, glass, wood, plastic, thermo coal and so. Selection of packaging materials depend upon type and quantity of food commodities. These packaging materials can also be recycle in order to prevent environmental pollution. Seventy two percent of the selected food handlers used cling films to keep the food fresh and evading the mosquitoes from entering the food. Food handlers pointed out that all the relevant information pertaining to the processed food should be clearly mentioned such as date of manufacture, expiry, lot and batch number and first in and first policy should be followed so that first processed products could be dispatched first and expired products can be discarded. Sixty six percent of the food handlers used appropriate packaging materials so that the processed food products are transported safely without cause any damage to the food product.

➤ **Attitude of food handlers with regard to packaging, labelling and transportation**

- Around seventy two percent of the selected food handlers mentioned that the importance of packaging in preserving the quality in terms of nutritional composition and also draws the attention of the customers as anything which is presented and promoted in an attractive packaging tends to capture demand

in the market. The colour, unique design, font and pictorial representation also plays an important factors in seeking attention becomes the highlight in the market. Nearly 78 percent of the selected food handlers stated that packed foods were free from contamination and enhance the shelf life of the food products. Nearly seventy one percent of the food handlers pointed out the proper labelling guarantee assurance to the consumers about the safety and purity of the product and it sought a recognition in the market and becomes popular among its competitors and customers will have a deep and good impression about the industry as well as its processed products. It was noted by 76 percent of the food handlers that proper packaging retained the shelf life and retained the expected quality of the customers until it reaches the destination. It also created a bridge between the manufactures and the middle men involved in the manufacturing of the processed product from the farm to costumers.

➤ **Practices of food handlers with regard to packaging, labelling and transportation**

- Around seventy two percent of the selected food handlers knew the importance of packaging as it helps in preserving the quality in terms of nutritional composition and draws the attention of the customers as anything which is presented and promoted in an attractive packaging tends to capture demand in the market. The colour, unique design, font and pictorial representation also plays an important factors in seeking attention becomes the highlight in the market. Nearly seventy eight percent of the selected food handlers stated that packed foods are free from contamination and enhance the shelf life of the food products. Nearly seventy one percent of the food handlers pointed out the proper labelling guarantee assurance to the consumers about the safety and purity of the product and it seeks a recognition in the market and becomes popular among its competitors and customers will have a deep and good impression about the industry as well as its processed products. It was noted by seventy six percent of the food handlers that proper packaging retails its shelf life and meets the expected quality of the customers until it reaches the destination and it creates a bridge between the manufactures and the middle men involved in the manufacturing of the processed product from the farm to costumers.

Even however many components impact the information and information on rehearses food handling and safe taking care of practices, the current examination concentrate on inferred that the compelling preparing mediation with reasonable review materials work on the information and information on rehearses on sanitation and safe taking care of practices among the food controllers of the products of the soil businesses. It is additionally uncovered that assuming the degree of information on sanitation is improved, the acts of the food controllers will likewise be improved and thus it will help in the decrease advancement of safe utilization of food sources for ideal wellbeing and health and furthermore for food borne infections from food enterprises and other public food administration outlets. The current review should be advocated among them for advancing solid safe taking care of practices for food handling and security.

Recommendation

- Food Safety Training should be imparted to all food handlers irrespective of also food groups like milk and milk products, cereal based products, pulses based products, poultry and meat products and nuts and oils and so on.
- Nutritional Composition and Shelf Life Studies should be practiced mandatory in all the food manufacturing industries to maintain the quality and quantity of food products.
- Good Handling practices and Food regulatory norms should be also made mandatory for all processing units.
- Correct and clear information regarding the nutritional food products should be clearly mentioned on the label of the food products.
- The Food Safety Officers should visit regularly and inspect all the processing units in their respective districts so as to ensure the quality and wellbeing of the food products.
- Future studies ought to include a joint effort with the Public authority and countless populace of food controllers so the approval build up a more thorough way to deal with guarantee food handling and safe took care of food items from human consumption.