INTRODUCTION

Juice may be defined as liquid form of fruits or vegetables. They are obtained after pressing fruits or vegetables by mechanical means. Fruits are consumed because of their nutritional importance and appealing taste, therefore their juice extract is commonly used all around the world. Human health can be improved if fruit juices are prepared keeping in view of hygiene. They can play important role against urinary tract infections, cancers and heart failure.

Fresh fruit juices are healthy choice if prepared hygienically, because it lacks various chemicals and coloring agents that are present in packed juices. Due to improper preparatory methods they are the major source of food borne diseases that leads to increase in morbidity and mortality. Bacterial contamination occurs because of lack of proper washing of fruits, unhygienic utensils and juice shops conditions. Using contaminated or unclean water for dilution, crushed unhygienic ice and prolong storage without using refrigerator are some of the other sources through which juices are contaminated. Water used to prepare fresh juices is a major source of contamination with microorganisms like streptococci and coliform. If microorganism is pathogenic it can lead to food poisoning epidemics.

Packed fruit juices are susceptible to spoilage by fungi, yeast and bacteria that require lactic acid for its growth. Spoilage occurs only in those packed juices having high PH. Low PH level usually prevent packed juices from spoilage.

Various outbreaks due to fruit juices around the world is reported in literature. In Florida theme Park USA; orange juice contaminated with salmonella affected more than 60 people. Another outbreak of salmonella food poisoning occurred due to consumption of orange juice in Australia that affected about four hundred and twenty seven people. A cholera outbreak due to contamination of vibrio cholera in sugarcane juice sold in the streets of Pune city of India.

Fruit juices are largely consumed in Pakistan. Due to lack of quality control laws, juices are liable to contamination with pathogenic micro-organisms. The purpose of the present study was therefore to address...
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the presence of coliforms in fresh and branded packed juices sold in the markets of Peshawar, Khyber Pakhtunkhwa, Pakistan. The present study is therefore very important for public health authorities and government to take necessary steps to prevent public from health consequences of unhygienic juices.

MATERIAL AND METHODS

A descriptive cross-sectional study was carried out to assess the coliform count in 10 different branded and 5 famous fresh juice samples obtained from different famous shops located in University Campus and Board area through non probability convenient sampling Technique. A total of 100 samples were taken between April, 2016 to May, 2016.

Sample size was calculated using following formula for sample size of unknown population.9

\[ n = \left( \frac{Z}{d} \right)^2 \times \left( \frac{S}{d} \right)^2 \]

n=Sample size

Z= standard variate at 95% confidence level

s=Maximum standard deviation which is taken as 0.25

d=margin of error which will be taken 5% in this study

Calculated sample size after putting data was 96.

For equal no of samples final sample size was taken as 100. The samples were stored in properly sealed sterile plastic bottles. All samples were analyzed in public health Laboratory Khyber Medical College.

Laboratory Procedure

Presumptive Coliform test was performed using Mackonkey broth Media.15 sterilized test tubes for fruit juice analyses were prepared. Equal quantity of media (Mackonkey broth) in the test tubes was taken. 10 ml sample was taken in first 5 test tubes, 1 ml sample in next 5 and 0.1 ml sample in last 5 test tubes respectively. Durham tube was putted in each test tube (for collection of gas) and all the tubes were plugged with sterile cotton swab. All the test tubes were incubator for 24 hours at 37°C yellow color change (acid formed by lactose fermentation) and gas formations after the incubation period were noted. Yellow color indicated that fermentation has taken place and coliform are present. Coliform were calculated from MPN index table.

RESULTS

A total of 100 samples were collected. 50 samples of packed juices which included 10 different brands. Five different flavors for each brand were selected.
packed juices. Highest count was noted in tops while lowest was in Shezan. Figure 2, shows mean coliform count in fresh juices. Highest count was noted in juice samples taken from Afghan Sadaqat juice shop which is located in board area. Figure 3 shows coliforms count on the basis of different flavors. Comparison of packed and fresh juices showed approximately close results as depicted in figure 4. Independent sample t-test was applied to show any statistical significance. From p-value it is cleared that fresh and branded juices is having no difference based on coliform count. From Table 1 it is cleared that the values are not statistically significant.

DISCUSSIONS

Pakistan is having no proper laws regarding safety of fruit juices. Lack of strict quality control laws leads to bacteriological contamination. As per World Health Organization criteria there should be no coliforms per 100 ml. Our results show high level of coliform count.

A study in Bangladesh on fresh and packed juices showed high number of bacterial load in both types (fresh and packed) of juices. Packed juice does not therefore guarantee that it would be free from pathogens10. Our study also showed high coliform count in both packed and fresh juices.

Improper handling and lack of hygienic practices are the common reason for juice contamination. Tambekar et al conducted a study on about 52 fresh juice sample from different areas of Amravati City, India. All samples were contaminated with different types of bacteria11. Other studies done in Andhra Pradesh and Nagpur city of India by Thirumala et al and Ankur Tarmare et al showed high coliform count in juices12,13. Our study results were similar to these studies. On the other hand Kamal Aneja et al also conducted a study on fresh orange and carrot juices. In this study low bacterial count was noted14. In contrast to this our study showed high bacterial count.

A study done in Tanzania by Nonga et al on hygienic practices in preparing fresh juices. Majority of juice vendors did not washed fruits, water for dilution was not properly boiled and majority of shops were situated on road side15. During samples collection similar findings were also observed by us. All selected juice shops were on road side and hygienic practices was lacking. Another study in Jeddah which showed high bacterial count in fresh fruit juices also matched our study results16.

Various national and local studies also showed high bacterial count. In a study done by Muhammad Naeem et al on different fresh fruit samples taken from different shops in Lahore city17; coliform count was exceeding in about 46% of samples. Our study showed high coliforms count in almost 100% samples. Another important findings in this study was antibacterial activity of honey when used on growing bacterial media. In Lahore another study was conducted on packed juices by Asad Nawaz. In this study coliforms were not detected18. In contrast to this, our study showed high coliform count. Another study in Pakistan was conducted in district Dir on branded juices by Muhammad Zahoor et al showed different types of bacteria in packed juices. Although packed juice is considered safe enough but findings suggest that they can be also a source of food borne diseases19.

In a local study done by Javaid et al Fresh and branded juices were compare for bacteriological quality. In this study packed juices were free of coliforms while fresh juice was having high bacterial count20. Our study results showed coliform in both types of juices. Keeping in view of high bacterial count in juices strict polices should be designed by government to ensure safety of consumers regarding food borne diseases.

CONCLUSION

Our study showed increase no of coliform in both branded and fresh juices therefore juices of our study area are unfit for drinking and liable to food borne diseases.

LIMITATIONS

Certain limitation were also encountered in this study. Samples of juices were taken from one particular area. Beside coliforms other bacteria causing food borne diseases should also be evaluated but lack of resources prevented us from further analysis for other bacteria. Further analysis for type of coliform was also not carried out.

Further research is recommended by taking samples from different areas including rural and urban. Common street vendor’s juices particular sugarcane and other colored juices; should also be analyzed for bacterial count.

REFERENCES


Table 1: Independent sample t test for statistical difference in E.coli count in packed and fresh juices

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CONFLICT OF INTEREST: Authors declare no conflict of interest

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AUTHOR'S CONTRIBUTION

Following authors have made substantial contributions to the manuscript as under:

Naeem M: Planned the Study.
Khalil KR: Statistical analysis.
Mustafa A: Manuscript writing.
Ibrahim M: Data Collection.
Zeb H: Compilation of Results.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.