

ASSESSMENT OF BACTERIOLOGICAL QUALITY OF FRUIT JUICES IN DISTRICT PESHAWAR

Mohammad Naeem, Kashif Ur Rehman Khalil, Adeela Mustafa, Mina Ibrahim, Hassan Zaib

Department of Community Medicine, Khyber Medical College, Peshawar - Pakistan

ABSTRACT

Objectives: To assess bacteriological quality of fruit juices in district Peshawar, Khyber Pakhtunkhwa.

Material and Methods: A cross sectional study was carried out on different samples of packed and fresh juices to determine the presence of coliform bacteria. A total of 100 samples were collected from April 2016 to May 2016 from different shops in University town and board area of Peshawar. Samples were analyzed in the Public Health Laboratory Community Medicine department, Khyber Medical College and multiple fermentation method was used to determine most probable number (MPN) of coliform in the juice samples.

Results: Bacteria (coliform) were detected in almost all samples and ranged from 02 to 20 MPN (Most Probable Number) /100mL. Fresh juice contained less no. of coliforms than packed juices.

Conclusion: Our study concluded that the packed and fresh fruit juices showed higher coliform count as compared to WHO standards and thus fruit juices of university campus and board areas are not satisfactory.

Key Words: Fruit Juices, Most Probable Number, coliform.

This article may be cited as: Naeem M, Khalil KurR, Mustafa A, Ibrahim M, Hassan Zeb H. Assessment of bacteriological quality of fruit juices in District Peshawar. J Med Sci 2017; 25: (4) 389-92.

INTRODUCTION

Juice may be defined as liquid form of fruits or vegetables. They are obtained after pressing fruits or vegetables by mechanical means¹. Fruits are consumed because of their nutritional importance and appealing taste, therefore their juice extract is commonly used all around the world². 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 failure³.

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 mortality⁴. Bacterial contamination occurs because of lack of proper washing of fruits, unhygienic

utensils and juice shops conditions⁵. 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 epidemics⁶.

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 spoilage⁷.

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 India⁸.

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

Dr. Mohammad Naeem (Corresponding Author)

Professor

Department of Community Medicine,
Khyber Medical College Peshawar - Pakistan

Cell: +92-300-5901841

Email: eaglebook@hotmail.com

Date Received: March 22, 2017

Date Revised: September 22, 2017

Date Accepted: October 20, 2017

Assessment of bacteriological quality of fruit juices in District Peshawar

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

$$n = \frac{(Z)^2 \times (S)^2}{(d)^2}$$

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.

Fresh fruit samples extracted from fruits with different flavors were selected from 5 famous juice shops. Figure 1, shows mean coliforms count in different brands of

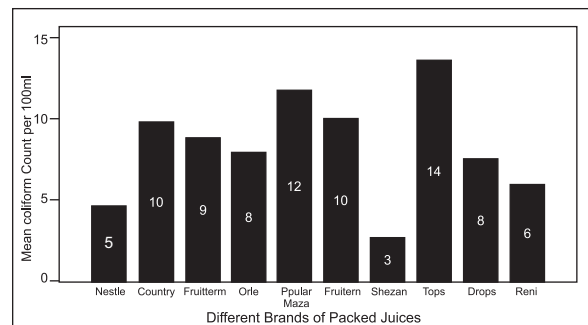


Figure 1: Mean coliform count per 100 ml in different brands of packed juices

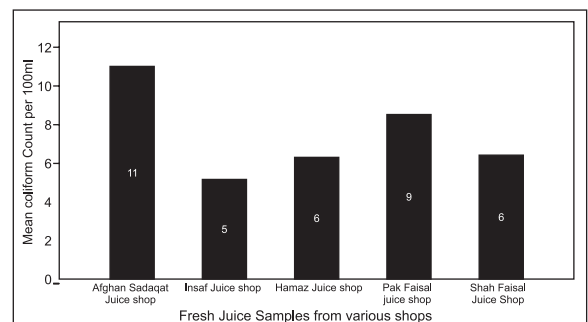


Figure 2: Mean Coliform count per 100 ml in Fresh juice samples

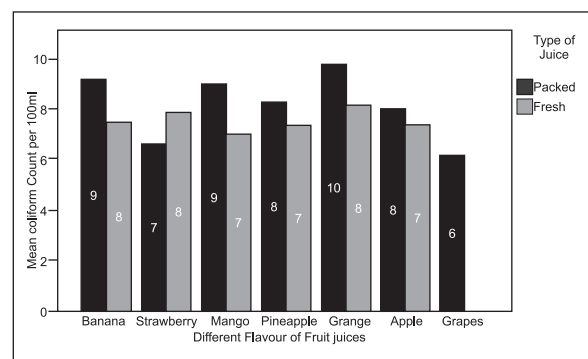


Figure 3: Mean coliform count per 100 ml in different flavors of Fresh and packed Juice samples

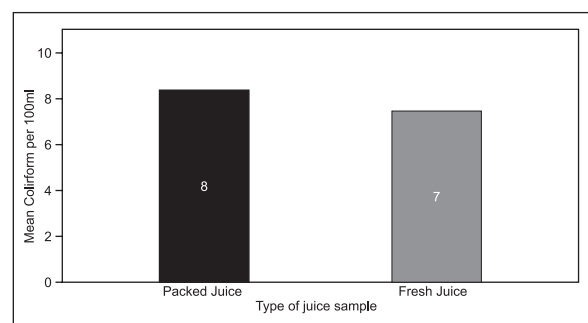


Figure 4: Comparison of Mean Coliform count per 100 ml in Fresh and packed juice samples

Assessment of bacteriological quality of fruit juices in District Peshawar

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

	t-test for Equality of Means				
	t	df	P-value	Mean Difference	Std. Error Difference
Equal variances assumed	1.109	98	.270	.820	.739
Equal variances not assumed	1.109	83.321	.271	.820	.739

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 Tirmare et al showed high coliform count in juices^{12,13}. 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 vender's juices particular sugarcane and other colored juices; should also be analyzed for bacterial count.

REFERENCES

1. Agwa OK, Ossai-Chidi LN, Ezeani CA. Microbial Evaluation of Orange Fruit Juice Sold in Port Harcourt, Nigeria. American Journal of Food Science and Nutrition Research. 2014;1(5):28-33.

Assessment of bacteriological quality of fruit juices in District Peshawar

2. Rubainu MG, Adam FI, Emelike FO. Bacteriological assessment of guava and orange fruits in north east Nigeria. *Innovations in Pharmaceuticals and Pharmacotherapy*.2013; 1 (2):76-80.
3. Olorunjuwon BO, Temitope BK, Muibat FO, Afolabi O. Microbiological quality of some locally-produced fruit juices in Ogun State, South western Nigeria. *J Microbiological Research*. 2014;2(1):1-8.
4. Divyashree S, Prakash J, Prabahavathis N. Microbial Quality of Selected Commercial Fresh Fruit Juices Sold in Mysore City. *Journal of Food Science Technology*. 2014;8 (1):30-34.
5. Leul A, Kibret M. Bacteriological Safety of Freshly Squeezed Mango and Pineapple Juices Served in Juice Houses of Bahir Dar Town, Northwest Ethiopia: *International Journal of Sciences*. 2012;6(1): 24-35.
6. Olaniyi O. Microbiological quality assessment of some National Agency for Food and Drug Administration and Control (NAFDAC) approved fruit juices sold in Ilorin metropolis. *African journal of food sciences*.2013;7(8):222-26.
7. Tasnim, F., H.M. Anwar, S. Nusrath, H.M. Kamal,D. Lopa A. Quality environment assessment of industrially processed fruit juices available in Dhaka City, Bangladesh. *Journal of Nutrition*.2016;16(1): 431-38.
8. Mahale DP, Khade RG, Vaidya VK. Microbiological analysis of street vended fruit juices from Mumbai city, India. *Internet Journal of Food Safety*. 2008;10(9): 31-34.
9. Simforian E. Assessment of Bacterial Quality And Associated Handling Practices Of Unpasteurized Fruit Juices Vended In Dar Es Salaam City, Tanzania. *Journal of Science, Food and Agriculture*.2013: 6(4)1317-22.
10. Kader MM, Mamun AA, Islam MT, Nigarin S. Bacteriological analysis of some commercially packed and fresh fruit juices available in Jessore city. *International Journal of Biosciences*. 2014; 5(1):415-20.
11. Tambekar DH, Jaiswal VJ, Dhanorkar DV, Gulhane PB, Dudhane MN. Microbial quality and safety of street vended fruit juices: A case study of Amravati city. *Internet Journal of Food Safety*. 2009;14(1): 782-87.
12. Thirumala CN, Venumadhav N, Ugandhar T. A study on the microbiological status of few samples of packed fruit juice. *Bioscience Discovery*.2013; 4(2): 160-64.
13. Titarmare A, Dabholkar P, Godbole S. Bacteriological Analysis of Street Vended Fresh Fruit and Vegetable Juices in Nagpur City, India. *Internet Journal of Food Safety*. 2009;11(2) :1-3.
14. Aneja KR, Dhiman R, Aggarwal NK, Kumar V, Kaur M. Microbes associated with freshly prepared juices of citrus and carrots. *International journal of food science*. 2014.3(1):1-7.
15. Nonga HE, Simforian EA, Ndabikunze BK. Assessment of physicochemical characteristics and hygienic practices along the value chain of raw fruit juice vended in Dares Salaam City. *Tanzania Journal of Health Research*.2014;16(4):1-12.
16. Al-Jedah JH, Robinson RK. Nutritional value and microbiological safety of fresh fruit juices sold through retail outlets in Qatar. *Pakistan Journal of Nutrition*. 2002;1 (2):79-81.
17. Iqbal MN, Anjum AA, Ali MA, Hussain F, Ali S, Muhammad A et al. Assessment of microbial load of un-pasteurized fruit juices and in vitro antibacterial potential of Honey against bacterial isolates. *The open microbiology journal*. 2015;9(1):26-30.
18. Nawaz A, Ali SW, Riaz M, Ahmad Z. comparison of the quality of fruit juices being sold in local markets of Lahore, Pakistan. *Journal of Hygienic Engineering and Design*.2016;1(4):35-39.
19. Zahoor M, Naz S. Microbial Evaluation of Branded Fruit Juices Sold in the City of Chakdara, Dir (Lower) Pakistan. *Middle-East Journal of Scientific Research*. 2013;16(8):1047-50.
20. Javid A, Naseem U, Khan FA, Saeed A, Zia ur rahman, Irshad A. Comparative microbiological quality evaluation of un-branded and branded juices of street vended sold in retail outlet of Peshawar City. *Am Eurasian J Agriculture Environ Sci*. 2013;13(8):1155-59.

CONFLICT OF INTEREST: Authors declare no conflict of interest

GRANT SUPPORT AND FINANCIAL DISCLOSURE NIL

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.