

# Contamination of Kitchen Towels in Rural and Urban Households

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**Abstract:** Kitchen towels are soft furnishings used for different cleaning activities in kitchen. Kitchen towels are harder than average bath towel. They are capable of absorbing and are used to wipe up spills, clean off cutting boards, dry dishes, dry hands and even hold hot plates and dishes. The bad cooking practices like use of same kitchen linen for different purposes, cross use of chopping boards, improper cooking of non-vegetarian food, wet kitchen, improper cleaning of kitchen, etc may contribute to the contamination of kitchen linens. The present study focuses on the use and care practices followed by home makers of urban and rural households while using kitchen towels. The difference in colonial count of micro-organisms where observed in the kitchen towels used in the urban and rural areas.

**Index Terms:** Contamination, Kitchen towels, kitchen linens, micro organisms, washing.

## I. INTRODUCTION

Kitchen is one of the important working areas in a house and also prone to high bacterial invasion. In a kitchen hygiene is an important factor as food gets easily contaminated by the attack of microorganisms. Different types of kitchen linens are used in the kitchen like apron, kitchen towel, dish towels, tea towels, oven mitt etc. Kitchen towels are in different types such as tea towels, dish towels, chef towel, etc. Dish towels are used to wash and dry utensils and also helpful to wipe moisture from dishes. Tea towels are small towels used for various purposes. Different types of kitchen linens are used for surface cleaning, wiping stove, wiping utensils, holding hot things etc. Few home makers use same kitchen towels for different purpose. The unsafe handling of kitchen towels may result due to lack of awareness, cooking practices, care and maintenance of the used kitchen linens and equipments used.

Kitchen is one of the perfect places that facilitate the growth of microorganisms. Microorganisms grow within seconds in their optimum temperature. Moisture also provides a better

condition to the growth of microbes. The bacterial infestation can be reduced by good cooking practices and awareness programs given to the people about the growth of microbes in kitchen. Increasing the frequency of replacing kitchen, proper drying of towels, probably using tissue papers instead of fabric kitchen towels, regular washing habits, using proper reagents for washing, use of separate towels for each purpose can also help in reducing contamination. The present study focus on the use and care practices of kitchen linens adopted by rural and urban households and to assess the contamination in kitchen linens of selected households.

## II. LITERATURE SURVEY

Cotton fabrics are used in home for different uses like curtains, draperies, bed spreads, comforters, sheets, towels, table mats, and napkins (Kaplan, 2009). Cotton is better to use in very greasy or gritty applications, grease and grit are difficult to remove from micro fiber (Maker, 2017).

Textile products from natural fibers such as cotton, and wool are susceptible to microorganism as the microbes find these fibers palatable. Microbes are survived in humid and warm conditions. Kitchen linens provide such environment for the growth and survival of microbes (Nkiwane & Chigo, 2014).

Mildew, bacteria, and yeasts will grow on cotton under conditions of high humidity and temperature. Starched or soiled cottons are more likely to be attacked than clean, un-starched cottons (Stout, 1981). E. coli and Salmonella, contaminated the cloth used for drying the dishes (Mattick, et al., 2003). Cross contamination can also occur in un expected places such as the refrigerator door handle high chair and appliance handles. Grooves in cutting boards can harbor bacteria (Rhinehart, Friedman, & McGoldrick, 2005).

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### III. METHODOLOGY

#### A. Survey

The study was conducted in urban areas of Aluva municipality and Angamaly municipality and rural areas of Chowwara and Palessary. All these areas belonged to Ernakulam District, Kerala. Sample constituted members of 25 households each from the selected areas which comprised of 50 from urban and 50 from rural areas. The study was conducted using questionnaire and information on use and care of kitchen towels were collected. Statistical analyses were done using chi-square test wherever applicable.

#### B. Contamination analysis

The researcher distributed kitchen towels made of 100% cotton to 3 rural and 3 urban households. These house holds were selected on a random basis. Those kitchen towels were named as 1R, 2R, 3R, 1U, 2U and 3U respectively and referral sample was named N. The subjects were requested to use it for cleaning kitchen surface for a period of 15 days. The microbial analysis was done at the end of fifteen days. Total CFU in the used kitchen towels and referral sample were studied.

### IV. RESULTS AND DISCUSSION

The results of the study are given and discussed.

#### A. Demographic Details of the Sample

Fig.1 shows the information about the details of age of the sample who responded for the survey. In both rural and urban areas about half of the sample were between age range of 41-60 years.

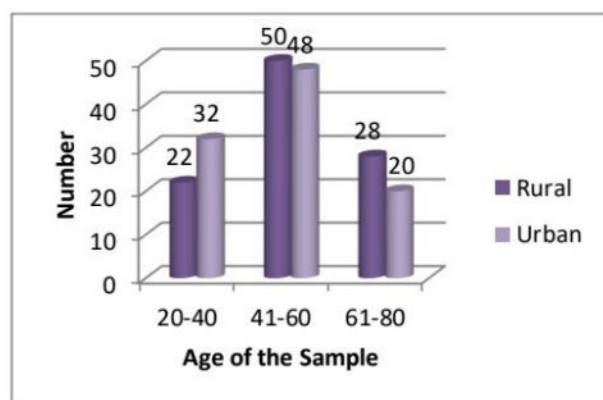


Fig. 1. Age Group of the Sample

Table I. Family Size

No. of family members	Urban (N=50)		Rural (N=50)	
	Frequency	%	Frequency	%
1-2	6	12	10	20
3-4	20	40	25	50
5-6	24	48	15	30

Table I shows the family size of the selected households. In rural area 50 percent of the sample had 3-4 members in the family, 30 percent of the sample had 5-6 members in the family, 20 percent of the sample had 1-2 members in the family.

In urban area 48 percent of the sample had 5-6 members in their family, 40 percent of the sample had 3-4 of members in their family and 12 percent of the sample had 1-2 members.

#### B. Use and Care of Kitchen Linens

Table II indicates the use of different types of kitchen linens in rural and urban areas. Analyzing the result by chi-square test showed that the difference in the use of apron, napkin, tea towels and dish cloths were highly significant among the samples of both urban and rural areas while it was found to be significant in the use of table cloth and oven mitts. No statistically significant difference was observed in the use of kitchen towel and sponges.

Table II. Types of Kitchen Linens Used<sup>#</sup>

Items	Urban (N=50)		Rural (N=50)		P-Value
	Frequency	%	Frequency	%	
Apron	26	52	7	14	.000053**
Kitchen towel	47	94	49	98	.609834 <sup>NS</sup>
Napkin	17	34	1	2	.000031**
Table cloth	25	50	14	28	.024117*
Tea towels	28	56	15	30	.008643**
Dish clothes	41	82	20	40	.000017**
Oven mitts	8	16	1	5	.014445*
Sponges	28	56	26	52	.688209 <sup>NS</sup>

\*\*p<0.01, \*p<0.05, <sup>NS</sup>Not significant

<sup>#</sup>Multiple Response

Table III shows the purpose for which kitchen towels are used in both urban and rural areas. It was found that the statistical test did not show any statistical significance between different usages of kitchen towels in both rural and urban areas.

Table III. Purpose of Using Kitchen Towels <sup>#</sup>

Items	Urban (N=50)		Rural (N=50)		P-Value
	Frequency	%	Frequency	%	
Wiping stove	41	82	46	92	.13708 <sup>NS</sup>
Holding hot things	39	78	45	90	.10170 <sup>NS</sup>
Cleaning surfaces	45	90	44	88	.74927 <sup>NS</sup>
Wiping utensils	20	40	16	32	.40465 <sup>NS</sup>

\*\*p<0.01, \*p<0.05, <sup>NS</sup>Not significant

<sup>#</sup>Multiple Response

Table IV. Preference for Kitchen Towels or Substitutes<sup>#</sup>

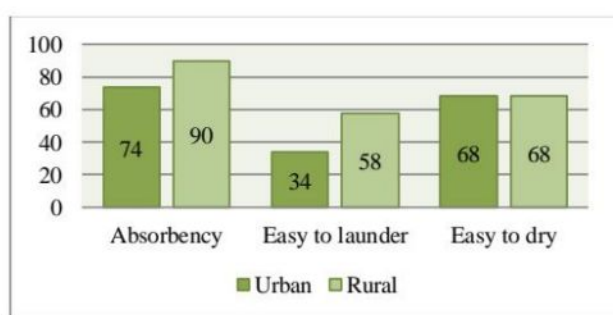
Items	Urban (N=50)		Rural (N=50)		P-Value
	Frequency	%	Frequency	%	
Old garments of family members	20	40	40	80	.000045**

Buy towels as such	30	60	18	36	.016309*
Both	8	16	10	20	.908683 <sup>NS</sup>

\*\*p<0.01, \*p<0.05, <sup>NS</sup>Not significant  
#Multiple Response

Table IV shows that old garments were used as substitute for kitchen towels in most of the rural households and the difference was found to be statistically highly significant. Buying towels as such was found to be more in urban areas and the difference was found to be statistically significant.

Fig. 2 show the properties considered by the sample for selecting kitchen towels. Absorbency and easy to launder was more preferred by subjects from rural areas. The easy to dry property was equally preferred by the respondents of both areas.



#Multiple Response

Fig. 2. Properties Considered While Selecting Kitchen Towel

Table V shows the frequency of washing kitchen towels. In urban area 70 percent of the sample washed kitchen towels daily, 22 percent of the sample washed them twice a day and 8 percent of the sample washed once in two days. In rural area, 76 percent of the sample washed towels daily, 14 percent of the sample washed once in two days and 10 percent of them washed twice a day

Table V. Frequency of Washing Kitchen Towels

Washing Frequency	Urban (N=50)		Rural (N=50)	
	Frequency	%	Frequency	%
Daily	35	70	38	76
Twice a day	11	22	5	10
Once in two days	4	8	7	14

Table VI. Washing Aids

Washing Frequency	Urban (N=50)		Rural (N=50)	
	Frequency	%	Frequency	%
Using soaps and detergents	47	94	46	92
Just rinse in cold water	3	6	2	4
Treat with hot water	6	12	1	2

#Multiple Response

Table VI shows the washing methods of kitchen towels. In urban sample, 94 percent of the sample washed kitchen towels using soap and detergents, 12 percent of the sample used hot water for washing and 6 percent of the sample just rinsed in cold water. In rural area, 92 percent of the sample washed kitchen towels using soap and detergents, 4 percent of the sample just rinsed them in cold water and 2 percent of the sample treated with hot water.

Table VII. Drying of Kitchen Towels Before Each Use

Response	Urban (N=50)		Rural (N=50)	
	Frequency	%	Frequency	%
Always	38	76	39	78
Sometimes	10	20	10	20
Never	2	4	1	2

Table VII shows the drying of kitchen towels before next use. In urban area 76 percent of the sample used completely dried kitchen towels between each use. 20 percent of them sometimes used dried towels and 4 percent of the sample never used completely dried towels for next use. In rural areas, 78 percent of the sample used completely dried kitchen towels before next use, 20 percent of the sample sometimes used completely dried kitchen towels and 2 percent of the sample never used completely dried kitchen linen.

Table VIII. Spare Kitchen Towels

Response	Urban (N=50)		Rural (N=50)	
	Frequency	%	Frequency	%
2-4	38	76	35	70
5-7	10	20	12	24
8-10	2	4	3	6

Table VIII shows that, in urban area 38 percent of the respondents had 2-4 spare kitchen towels, 20 percent kept 5-7 spare kitchen towels and 4 percent of the sample kept 8-10 spare towels for use. In rural area, 70 percent of the respondents had 2-4 spare kitchen towels for use, 24 percent of the sample had 5-7 kitchen towels and 6 percent of the sample had 8-10 spare kitchen towels.

### C. Microbial Analysis of Kitchen Towels

The microbial analysis of kitchen towels from selected households was carried out to study the contamination. The total CFU count was determined.

#### 1) Colony Forming Unit (CFU)

Table IX shows the colony forming unit count, in urban area the colony forming unit value for sample one 1,000,000 at 10<sup>-5</sup> dilution, sample two the colony forming unit count value was 1,000,000 at 10<sup>-5</sup> dilution, and sample 3 the value for colony forming unit was 10<sup>-2</sup>dilution.

In rural area the colony forming unit count for sample one was 1,45000 at 10<sup>-2</sup> dilution, the colony forming unit of sample 2 was 1,70000 at 10<sup>-2</sup> dilution and colony forming unit count for sample three 160,000,000 at 10<sup>-2</sup> dilution. The CFU value

for referral sample was 1, 63000 at 10<sup>-2</sup> dilution the bacterial contamination in cotton fabric were studied by the researcher.

CFU count showed that in 2 out of 3 samples from urban area, the contamination of kitchen towels was higher than referral sample. The remaining one kitchen towel sample of urban area showed very low contamination since it was laundered twice daily. In rural area, 2 out of 3 sample showed contamination nearer to the referral sample. The remaining one kitchen towel sample of rural area showed very high contamination since it was used to wipe both kitchen surface and stove.

Table IX. Colony forming unit (CFU)

Sl.No.	Sample	Dilution	CFU
1	1 U	10 <sup>-5</sup>	1,000,000 CFU
2	2 U	10 <sup>-5</sup>	1,000,000 CFU
3	3 U	10 <sup>-2</sup>	210000 CFU
4	1 R	10 <sup>-2</sup>	1,45000 CFU
5	2 R	10 <sup>-2</sup>	1,70000 CFU
6	3 R	10 <sup>-2</sup>	160,000,000 CFU
7	N	10 <sup>-2</sup>	1,63000 CFU

#### CONCLUSION

From the study it can be concluded that the kitchen towels used in both urban and rural areas were used and laundered regularly but it was better maintained in rural areas. Difference in use, care and maintenance of kitchen linen made difference in the contamination level of kitchen towels. The careless use of kitchen linen creates a drastic change in the growth of microbes. Proper washing, frequent changing of kitchen towels and avoidance of cross contamination are the things to be considered for reducing contamination.

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#### REFERENCES

- Kaplan, N. (2009). *A Practical Guide to Fibre Science*. Abhishek Publications.
- Maker, M. (2017). *Clean My Space: The Secret to Cleaning Better, Faster--And Loving Your Home Every Day*. Canada: Penguin Books .
- Mattick, K., Durham, K., Domingue, G., Jørgensen, F., Mithu, S., Schaffner, D. W., & Humphrey, T. (2003). The survival of foodborne pathogens during domestic washing-up and subsequent transfer onto washing-up sponges, kitchen surfaces and food. *International Journal of Food Microbiology*, 85(3), 213-226.

Nkiwane, L., & Chigo, T. (2014). Microbial Analysis of Woven Cotton Kitchen Towels. *Zimbabwe Journal of Science & Technology*, 9(1), 47-58.

Rhinehart, E., Friedman, M. M., & McGoldrick, . (2005). *Infection Control in Home Care and Hospice*. Jones & Bartlett Learning.

Stout, E. E. (1981). *Introduction to textiles* (3 ed.). Taipei : Central Book Co.

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