RESEARCH ARTICLE

Knowledge about kitchen hygiene and associated factors in caregivers in a peri-urban area of Lima [version 1; peer review: 1 approved with reservations]

Michelle Lozada-Urbano ¹, Doris Miranda², Franklin Huamán³, Jesus Chirinos-Cáceres⁴, Oriana Rivera-Lozada¹

¹South American Center for Education and Research in Public Health, Universidad Privada Norbert Wiener, Lima, Perú, 15046, Peru

²Instituto de Matemáticas IMAG, Universidad de Granada, Spain, Spain

³Facultad de Ingeniería Económica, Estadística y de Ciencias Sociales, Universidad de Ingeniería, Lima, Peru

⁴Universidad Peruana Cayetano Heredia, Lima, 07031, Peru

V1 First published: 07 Feb 2022, 11:149
<https://doi.org/10.12688/f1000research.75446.1>
 Latest published: 23 Nov 2022, 11:149
<https://doi.org/10.12688/f1000research.75446.2>

Abstract

Background: The objective of this study was to identify the factors associated with caregivers' knowledge of kitchen hygiene in San Juan de Lurigancho (SJL).

Methods: This was a cross-sectional study. We surveyed 250 mothers at *comedores populares* (a sort of community kitchens which are very popular in Lima) and who were part of mothers' clubs in the areas of Huascar V and San Pablo, in SJL in Lima. The sample was selected through non-probability convenience sampling. A questionnaire with three dimensions (cleanliness, storage and contamination of children) was administered.

Results: On average, in Huascar and San Pablo, most caregivers were the children's mothers (93.2%); most of the caregivers were between 21 and 30 years old (54%); they had secondary level of education (70.4%); they were living in free union with their partners (69.2%); they were mainly housewives (80.4%); their houses were constructed with materials different from brick and cement (68.4%); and their houses had a bare floor (70.0%). They did not have drinking water in the kitchen (88.4%); they did not use a gas stove (88.4%), a refrigerator (50.0%), a radio (82.0%), or a microwave (16.4%). A good level of knowledge of food hygiene was found in 63.2% of caregivers. No predictive capacity of the assessed sociodemographic characteristics on the level of knowledge of kitchen hygiene was identified.

Conclusions: This study determined that the assessed sociodemographic variables were not significantly associated with the level of knowledge about kitchen hygiene. It is necessary to improve mothers' knowledge about the handling and consumption of spoiled food and their effect on children's health.

Open Peer Review

Approval Status

	1
version 2	
(revision)	view
23 Nov 2022	
version 1	
07 Feb 2022	view

1. **Morad Guennouni** , Hassan First
 University of Settat, Settat, Morocco

Any reports and responses or comments on the article can be found at the end of the article.

Keywords

knowledge, food, kitchen, cleanliness, storage

This article is included in the **Sociology of Health** gateway.

Corresponding author: Michelle Lozada-Urbano (michelle.lozada@uwiener.edu.pe)

Author roles: **Lozada-Urbano M:** Conceptualization, Supervision, Writing – Original Draft Preparation, Writing – Review & Editing; **Miranda D:** Methodology, Software, Writing – Review & Editing; **Huamán F:** Data Curation, Formal Analysis, Methodology; **Chirinos-Cáceres J:** Conceptualization, Visualization, Writing – Review & Editing; **Rivera-Lozada O:** Project Administration, Resources, Writing – Original Draft Preparation, Writing – Review & Editing

Competing interests: No competing interests were disclosed.

Grant information: The author(s) declared that no grants were involved in supporting this work.

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How to cite this article: Lozada-Urbano M, Miranda D, Huamán F *et al.* **Knowledge about kitchen hygiene and associated factors in caregivers in a peri-urban area of Lima [version 1; peer review: 1 approved with reservations]** F1000Research 2022, 11:149 <https://doi.org/10.12688/f1000research.75446.1>

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Introduction

Poor food storage and handling as well as poor kitchen hygiene contribute to a large number of foodborne diseases (FDs).¹ Up to 87% of food poisoning incidents originate at home due to improper food handling.^{2,3} FDs are a threat to public health in this century due to the role of the household in the transmission and acquisition of foodborne diseases. The most frequent causes are diarrheal pathogens,⁴ on contaminated surfaces such as kitchen towels⁵ and chopping boards in the kitchen⁶ as they can harbour a large number of coliforms. The most affected are children under 60 months old.⁷ In the event of diarrhoea in the child, mothers offer less food and the nutrients needed for growth decrease, and can result in malnutrition and make them more prone to illnesses,⁸ infections, and inadequate development.⁹

In many countries, hygiene and infant feeding processes become a highly vulnerable point due to poor handling,^{10,11} affecting 13.2% of children aged six to 60 months. Research in the peri-urban area of Lima showed that 21.8% of the children who required hospitalization were referred for diarrhoea.¹²

Despite education efforts, consumers develop unsafe food storage and handling behaviours, contaminating sponges, kitchen towels, making them reservoirs and vectors of bacteria in the kitchen and contaminating other surfaces.¹³ Peru has a food sanitary regulation, according to the Dirección General de Salud Ambiental DIGESA,¹⁴ which regulates the products for sale and consumer defence code. The Health Ministry, Ministerio de Salud MINSA has published manuals on good food handling practices, aimed at restaurants, sale stores, but there are not any for mothers in the home.

Mothers play an important role in the prevention and control of FDs in regard to hygiene measures, including production, storage, food handling and hygienic practices.¹⁵ Dirty hands, stool remains, microbial load in water, flies, parasites, the presence of animals in the kitchen, poorly washed containers, and an unhygienic environment contaminate food.¹⁶ Studies in mothers in the rural jungle and highlands of Peru showed that only 20% of them washed their hands before touching food and only 6% of those who did used soap.¹⁷ In other countries, mothers have associated optimal cleaning of food products with preventing diseases, achieving a state of good health.¹⁸

There is information showing the economic and demographic aspects (e.g., rural living, poor access to water) related to mothers' knowledge in regard to kitchen hygiene. In this study we proposed to establish whether the mothers' socio-demographic characteristics were related to good knowledge about food management in the home or not, in a population of mothers in a peri-urban area of Lima. The results can be an opportunity to understand this group of mothers and their role in food management, since many of them are the main agent of the preparation of meals for their families.

Methods

We conducted a cross-sectional observational study. The study was carried out in a peri-urban area in Lima, Peru in the human settlements of San Pablo and Huáscar V (SJL).

Participant selection

The population of interest was mothers with children, attending two *comedores populares* and/or mothers' clubs. This was a non-probability convenience sample.

Mothers were approached at the *comedores populares* and mothers' clubs. However, in the case of Huascar V, mothers who were at a health post were interviewed as well, to complete the sample. Two experienced field workers (MOC and MRR) helped with the face-to-face interviews.

Permits were requested from the *comedor populares* and the health facility before surveying the mothers. The mothers were explained about the questionnaire and they were asked to sign the informed consent form. The interviewers mentioned that the mothers were suspicious when listing the appliances they had in their homes.

A total of 250 women or caregivers were interviewed, distributed in the areas described (San Pablo = 125 and Huascar V = 125). Inclusion criteria were mothers who had a child under 60 months old and prepared food for them at home, and who voluntarily agreed to participate in the study by signing the informed consent form. Exclusion criteria were mothers or caregivers who had a child with a cognitive impairment.

Administration of the questionnaire

The questionnaire had three dimensions: the first assessed the kitchen hygiene process; the second dimension evaluated the storage of products; and the last dimension examined the food-disease relationship based on the ingestion of spoiled products. A principal components analysis was applied; Kuder- Richardson (KR-20) was applied due to the dichotomous nature of variables, to define the internal validity; finally, the Kaiser-Meyer-Olkin (KMO) test and Bartlett's test of sphericity were applied to define the validity of the test. The test results showed the following: KMO = 0.549;

Table 1. Questionnaire items.

Statements	Scale dimensions
Chopping boards may have bacteria that can cause contamination of other products.	Cleanliness
Sponges that are used to wash surfaces and utensils can harbour bacteria and microorganisms.	
Wipes that are used to wash utensils and clean surfaces have bacteria and microorganisms.	
The table where children eat can contaminate the food they are going to eat.	
Garbage can be uncovered, or the garbage bag can be open, as long as food and utensils are protected or covered.	Storage
Glass is of high quality for food storage.	
Cooking kills all the bacteria that may be in the food.	
Utensils will be clean when using dishwasher detergent.	
Food consumption can cause diseases in children.	Contamination of the child
Diarrhoea and discomfort in children may have originated in food.	

Barlet's 591.678; $gl=136$, ($p < 0.05$). The three components (kitchen hygiene, product storage and disease from ingestion of spoiled foods) explained 66.75% of the total variance of the test.¹⁹ In this study, we need the sum of the questions of each dimension to calculate the total score, according to Table 1. As for the answers, yes (affirmative answer) and no (negative answer) were tabulated.

The knowledge variable was measured as follows:

Good knowledge of food hygiene: If the participant had more than seven "YES" answers out of 10 questions, it was considered good knowledge of food hygiene in the home.

Not so good knowledge of food hygiene: If the participant had fewer than or seven "YES" answers out of 10 questions, it was considered not so good knowledge of food hygiene in the home.²⁰

Sample

The sample was obtained for convenience.

The sample was obtained with the following sampling proportion formula for a finite population.

$$n = \frac{Z^2 p * q * N}{N e^2 + Z^2 p * q}$$

Where:

Z = confidence level = 1.96 $\alpha = 0.05$

p = Probability in favour = 50% of kitchen hygiene knowledge

q = Probability against = 50% kitchen hygiene knowledge

N = Universe

e = estimation error

n = sample size

We adopted a non-probabilistic sampling strategy to compare knowledge according to sociodemographic profile. The final sample for the study consisted of 250 mothers or caregivers who attended the *comedores populares* and mothers' clubs in the areas of San Pablo and Huáscar, where each area counted 125 participants.

Variables

Dependent variable (Y1): Knowledge of kitchen hygiene.

Independent variables (X1): Education level, occupation of the mother, marital status, caregiver (refers to the person who has a child, and takes care of it or can be just a caregiver), age of the mother, house building material, house floor material, drinking water, owning a gas stove, owning a refrigerator, a radio or television set, a microwave.

Research execution

We visited the mothers' clubs and *comedores populares* in Huáscar V and San Pablo, in SJL, to ask permission from the people in charge of these organizations and to inform them about the activities that were going to be carried out. This included approaching the mothers during the morning shift, very close to lunchtime. Only in Huascar V, the sample was completed with mothers who were interviewed at the health facility where mothers take their children for health checks, doctor appointments and vaccinations. Two field workers assisted with the face-to-face interviews (MOC and MRC). Prior to starting the questionnaire (as described in Table 1), the informed consent process was conducted. Detailed information about the study was provided to each potential participant, who was given the opportunity to ask questions and clarify doubts. After that, if they agreed to participate, they proceeded to sign the informed consent form. The questionnaires were completed in almost two months between April and May, 2018. Mothers were interviewed at the *comedores* or, if necessary, at home.

Analysis plan

The analysis was conducted using Stata/SE 15.0 software for Windows, at the Universidad Peruana Cayetano Heredia (UPCH). Categorical variables were described as frequencies. The influence of sociodemographic variables or independent variables (education level, occupation of the mother, marital status, caregiver, age of the mother, house building material, floor material, drinking water, gas stove, refrigerator, radio or television set, microwave) on the dependent variable (knowledge of kitchen hygiene) was assessed through logistic regression analysis. Odds ratios (ORs) with 95% confidence intervals were reported. A p-value lower than 0.05 was considered statistically significant.

Ethical considerations

This study was approved by the Institutional Ethics Committee (IEC) of Universidad Peruana Cayetano Heredia. An informed consent form was prepared and signed by all the mothers and/or caregivers. Before signing, they were given information about the study, the use of the answers and how the information obtained will be kept under codes and that the questionnaires were anonymous. Finally, they signed the consent form if they decided to participate.

Results

A total of 250 caregivers were interviewed: 91.2% (114) of them were mothers in Huascar V and 95.2% (119) were from San Pablo. Fifty-four percent of the caregivers were between 21 and 30 years old. The highest education level achieved in Huascar V and San Pablo was secondary school (68.8% (86) and 72.0% (90), respectively). In Huascar V and San Pablo, the majority were in a free union (68.0%(85) and 70.4%(88), respectively), were housewives (82.4%(104) and 78.4%(98), respectively), had brick and cement as house building material (68.0% (85) and 68.8%(86), respectively); they had a bare floor (70.4%(88) and 69, 6%(87), respectively), did not have drinking water (88.0%(110) and 88.8%(111), respectively), no gas stove (96.8%(121) and 96.0%(120), respectively), refrigerator (48.8%(61) and 51.2%(64), respectively), radio and TV set (79.2%(99) and 84.8%(106), respectively), and no microwave oven (82.4%(103) and 84.8%(106), respectively) respectively, see Table 2.

Table 3 shows the percentage of questionnaire answers about knowledge of kitchen hygiene in Huáscar and San Pablo, where the mothers or caregivers were surveyed.

The caregivers from Huáscar responded affirmatively to the questions related to knowledge about cleanliness and storage in the kitchen (5, 6, 7, and 8) in a higher proportion than the caregivers in San Pablo.

In Table 4, we can see that the bivariate regression analysis did not identify any predictive capacity of any evaluated sociodemographic characteristic on the level of knowledge of kitchen hygiene.

However, we can observe that in the age group older than 30, there was a higher proportion of caregivers with good knowledge of kitchen hygiene compared to the group aged 30 years or younger.

In addition, when the caregiver's role was filled by the grandmother or another person, most of them did not have a good level of knowledge of kitchen hygiene.

Table 2. Description of sociodemographic characteristics of the mothers or caregivers in the areas of Huáscar V and San Pablo, in San Juan de Lurigancho, obtained from survey results.

Characteristics	Huascar (n=125) n(%)	San Pablo (n=125) n(%)	Total (n=250) n(%)
Caregiver			
Mother	114(91,2)	119(95,2)	233(93,2)
Grandmother	8(6,4)	5(4,0)	13(5,2)
Others	3(2,4)	1(0,8)	4(1,6)
Caregiver's age (years)			
17 to 20	14 (11,2)	20(16,0)	34(13,6)
21 to 30	71(56,8)	64(51,2)	135(54)
31 to 40	36(28,8)	37(29,6)	73(29,8)
41 or older	4(3,2)	4(3,2)	8(3,2)
Education level			
Without formal education, complete and incomplete primary	27(21,6)	23(18,4)	50(20,0)
Complete and incomplete secondary	86(68,8)	90(72,0)	176(70,4)
Higher education	12(9,6)	12(9,6)	24(9,6)
Marital status			
Married	13(10,4)	11(8,8)	24(9,6)
Free union	85(68,0)	88(70,4)	173(69,2)
Divorced	27(21,6)	26(20,8)	53(21,2)
Occupation			
Housewife	103(82,4)	98(78,4)	201(80,4)
Other	22(17,6)	27(21,6)	49(19,6)
House building material			
Owner/cement and brick	24(19,2)	24(19,2)	48(19,2)
Owner, other material	85(68,0)	86(68,8)	171(68,4)
Rented	16(12,8)	15(12,0)	31(12,4)
Floor material			
Cement	37(29,6)	38(30,4)	75(30,0)
Dirt	88(70,4)	87(69,6)	175(70,0)
Drinking water			
Yes	15(12,0)	14(11,2)	29(11,6)
No	110(88,0)	111(88,8)	221(88,4)
Gas stove			
Yes	4(3,2)	5(4,0)	9(3,6)
No	121(96,8)	120(96,0)	241(96,8)
Refrigerator			
Yes	61(48,8)	64(51,2)	125(50,0)
No	64(51,2)	61(48,8)	125(50,0)
Radio and TV set			
Yes	99(79,2)	106(84,8)	205(82,0)
No	26(20,8)	19(15,2)	45(18,0)
Microwave oven			
Yes	22(17,6)	19(15,2)	41(16,4)
No	103(82,4)	106(84,8)	209(83,6)

Table 3. Knowledge about kitchen hygiene of mothers or caregivers in the Huáscar V and San Pablo areas, San Juan de Lurigancho (n= 250).

Characteristics		Huascar	San Pablo	Total
		n(%)	n(%)	n(%)
Chopping boards may have bacteria that can cause contamination of other products.	no	6(4,8)	5(4,0)	11(4,4)
Sponges that are used to wash surfaces and utensils can harbour bacteria and microorganisms.	yes	119(95,2)	120(96,0)	239(95,6)
Wipes that are used to wash utensils and clean surfaces have bacteria and microorganisms.	no	8(6,4)	15(12,0)	23(9,2)
The table where children eat can contaminate the food they are going to eat.	yes	117(93,6)	110(88,0)	227(90,8)
Garbage can be uncovered, or the garbage bag can be open, as long as food and utensils are protected or covered.	no	5(4,0)	12(9,6)	17(6,8)
	yes	120(96,0)	113(90,4)	223(93,2)
Chopping boards may have bacteria that can cause contamination of other products.	no	0(0)	1(0,8)	1(0,4)
	yes	125 (100)	124(99,2)	249(99,6)
Garbage can be uncovered, or the garbage bag can be open, as long as food and utensils are protected or covered.	no	17(13,6)	48(38,4)	65(26,00)
Glass is of high quality for food storage.	yes	108(86,4)	77(61,6)	185 (74,00)
Cooking kills all the bacteria that may be in the food. Utensils will be clean when using dishwasher detergent.	no	8(6,4)	23(18,4)	31(12,4)
	yes	117(93,6)	102(81,6)	219(87,6)
Food consumption can cause diseases in children.	no	3(2,4)	36(28,8)	39(15,6)
	yes	122(97,6)	89(71,2)	211(84,4)
Garbage can be uncovered, or the garbage bag can be open, as long as food and utensils are protected or covered.	no	34(27,2)	66(52,8)	100(40,0)
Glass is of high quality for food storage.	yes	91(72,8)	59(47,2)	150(60)
Cooking kills all the bacteria that may be in the food. Utensils will be clean when using dishwasher detergent.	no	99(79,2)	83 (66,4)	182(72,8)
	yes	26(20,8)	42(33,6)	68(27,2)
Food consumption can cause diseases in children.	no	47(37,6)	47(37,6)	94(37,6)
	yes	78(62,4)	78(62,4)	156(62,4)

Furthermore, when the caregiver had reached a secondary level of education, most of them showed a good level of knowledge about kitchen hygiene in contrast to the group with primary or higher education.

Discussion

In the investigated areas of SJL (San Pablo and Huáscar V), the surveyed mothers were mainly housewives and had a secondary education level. The vast majority of households lacked water and sewage services.

Although no significant associations were identified between the variables studied and the level of knowledge of kitchen hygiene, the mothers' education and age in other studies were associated with knowledge of safe food handling and consumption in the home.²¹ Years of school attendance could improve hygiene knowledge, as well as generating a larger social network in which mothers or caregivers interact. Likewise, having a radio in a large percentage of households can be a channel to increase mothers' knowledge and good practices and to obtain appropriate cooking behaviours, through hygiene educational programs. In other studies, mothers' occupations (homemaker or work outside the home) was shown to be associated with more satisfactory hygienic practices in relation to food poisoning prevention.^{19,22}

Mother with lower socioeconomic status have been found more likely to experience food products with a high microbial count.²³ Our study presented the limitation of not including the microbial count. Studies such as Gil *et al.*, 2014, have shown that this measure has been an accurate indicator to determine families' household cleaning condition.²⁴

Table 4. Socio-demographic profile according to knowledge of kitchen hygiene among caregivers in the areas of Huáscar V and San Pablo, San Juan de Lurigancho (n = 250).

Characteristics		Not so good knowledge of hygiene n=92 (36.8%)	Good knowledge of hygiene n=158 (63.2%)	P value	OR (CI 95%)
Age group	17 to 20	14(15.2)	19(12.0)	Ref	Ref
	21 to 30	56(60.9)	80(50.6)	0.896	0.950 (0.4398, 2.0522)
	31 to 40	22(23.9)	51(32.3)	0.218	0.585 (0.2496, 1.3729)
	41 and over	0(0)	8(5.1)	NA	1
Type of relation	Mother	82(89.1)	151(95.6)	0.059	2.631 (0.9652, 7.1695)
	Grandmother or other	10(10.9)	7(4.4)		
Level of education of the mother	Primary	21(22.8)	29(18.4)	Ref	Ref
	Secondary	62(67.4)	114(72.2)	0.381	0.751 (0.3956, 1.4260)
	Higher	9(9.8)	15(9.5)	0.712	0.829 (0.3051, 2.2504)
	Married	9(9.8)	15(9.5)	Ref	Ref
Marital status	Free union	65(70.7)	108(68.4)	0.995	1.003 (0.4153, 2.4227)
	Divorced	18(19.6)	35(22.2)	0.763	0.857 (0.3144, 2.3371)
	Housewife	72(78.3)	129(81.6)	0.516	1.236 (0.6525, 2.3398)
Occupation	Other	20(21.7)	29(18.4)		
	Own home made of brick and cement	24(26.1)	24(15.2)	Ref	Ref
House building material	Own home made of other material	59(64.1)	112(70.9)	0.052	0.527 (0.2756, 1.0068)
	Rented	9(9.8)	22(13.9)	0.068	0.409 (0.1566, 1.0684)
	Cement	27(29.3)	48(30.4)	0.864	1.051 (0.5986, 1.8436)
Floor material	Dirt	65(70.7)	110(69.6)		
	Yes	10(10.9)	19(12)	0.783	0.892 (0.3957, 2.0113)
Drinking water	No	82(89.1)	139(88)		
	Yes	5(5.4)	4(2.5)	0.246	2.213 (0.5789, 8.4570)
Gas stove	No	87(94.6)	154(97.5)		
	Yes	49(53.3)	76(48.1)	0.432	1.230 (0.7347, 2.0575)
Refrigerator	No	43(46.7)	82(51.9)		
	Yes	74(80.4)	131(82.9)	0.623	0.847 (0.4375, 1.6411)
Radio and TV set	No	18(19.6)	27(17.1)		
	Yes	19(20.7)	22(13.9)	0.168	1.609 (0.8180, 3.1648)
Microwave oven	No	73(79.3)	136(86.1)		

Likewise, demographic and socioeconomic factors may have contributed to unsafe food handling behaviours and microbial contamination risks during preparation.²⁵ Poor food handling has been evidenced among low-income consumers.²⁶

This study was conducted in a peri-urban area of Lima; some of our limitations may be due to the fact that the entire study population had the same socioeconomic status. Through an evaluation that includes heterogeneous populations, we could obtain complementary results regarding the influence of other variables not examined in the present study, that could improve our understanding of kitchen hygiene knowledge. It is important to highlight that data collection through interviews and surveys is prone to the possibility that the information revealed by the participants may be incomplete or not entirely truthful, which could directly impact the validity of the results.

Conclusions

We could not identify a predictive capacity in regard to the level of knowledge of kitchen hygiene in the evaluated sociodemographic characteristics in this sample.

Data availability

Underlying data

Figshare: Knowledge about kitchen hygiene and associated factors, <https://doi.org/10.6084/m9.figshare.16960207.v1>.²⁷

This project contains the following underlying data:

- DB Depurada 07Oct21 ENG.xls (coded questionnaire responses and dictionary)

Extended data

Figshare: Kitchen hygiene questionnaire, <https://doi.org/10.6084/m9.figshare.17868758.v1>.²⁸

This project contains the following extended data:

- Cuestionario ETA.docx (questionnaire in English)

Data are available under the terms of the [Creative Commons Attribution 4.0 International license](#) (CC-BY 4.0).

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Current Peer Review Status: ?

Version 1

Reviewer Report 11 May 2022

<https://doi.org/10.5256/f1000research.79321.r135252>

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Morad Guennouni

Laboratory of Health Sciences and Technologies, Higher Institute of Health Sciences of Settati, Hassan First University of Settati, Settati, Morocco

Hygiene and food safety play a key role in the prevention of foodborne illnesses. In this context comes this article to assess knowledge about kitchen hygiene and associated factors in caregivers in a peri-urban area. The results of this study will encourage officials to provide these inhabitants with the necessary means to improve their living conditions.

Comments:

Abstract:

- Background:

It is better to start with a general statement before indicating the objective of this study.

- Conclusions:

You said in conclusion that: "it is necessary to improve mothers' knowledge about the handling and consumption of spoiled food and their effect on children's health". I think that you must add in result section that the limit level of mothers' knowledge about the handling and consumption of spoiled food.

Introduction:

- Good

Methods:

- Administration of the questionnaire:

I want to know if the questionnaire is developed or adapted from a questionnaire already established.

I want to know if you study the reliability (by Cronbach's α for example) and the reproducibility (by Intraclass for example) of the questionnaire with a small sample before the distribution of the questionnaire to the global sample.

It is preferable to indicate the number of item in each dimensions.

Results:

- More descriptions on the results presented in Table 3 are needed in the manuscript 5.

Discussion:

- The discussion is quite limited. I think more details are needed.

Conclusion:

- The conclusion is also quite limited. A paragraph about preventive and corrective actions is needed.

Is the work clearly and accurately presented and does it cite the current literature?

Yes

Is the study design appropriate and is the work technically sound?

Yes

Are sufficient details of methods and analysis provided to allow replication by others?

Partly

If applicable, is the statistical analysis and its interpretation appropriate?

Partly

Are all the source data underlying the results available to ensure full reproducibility?

Yes

Are the conclusions drawn adequately supported by the results?

No

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Food safety

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard, however I have significant reservations, as outlined above.

Author Response 23 May 2022

Michelle Lozada-Urbano

We thank the reviewer for his suggestions for improvement.

Abstract:

Background:

It is better to start with a general statement before indicating the objective of this study.

Answer: Food and kitchen hygiene are necessary conditions for safe food and prevent foodborne illnesses.

Conclusions:

You said in conclusion that: "it is necessary to improve mothers' knowledge about the handling and consumption of spoiled food and their effect on children's health". I think that you must add in result section that the limit level of mothers' knowledge about the handling and consumption of spoiled food.

Answer:

Table 3 shows the results obtained for each of the questions in the questionnaire, according to the Huascar and San Pablo zones. Boundaries for Good knowledge of food hygiene: If the mother interviewed had more than seven answers out of 10 questions it was considered as good knowledge about food hygiene in the household.

Not so good knowledge of food hygiene: If the mother interviewed had less than or equal to seven answers out of 10 questions it was considered as not so good knowledge about food hygiene in the household. This classification is found at the end of Table 1.

Methods:

Administration of the questionnaire:

I want to know if the questionnaire is developed or adapted from a questionnaire already established.

Answer:

We apply the same questionnaire of a publication.

I want to know if you study the reliability (by Cronbach's α for example) and the reproducibility (by Intraclass for example) of the questionnaire with a small sample before the distribution of the questionnaire to the global sample.

Answer:

The item Cleaning practices had a KR-20=0.722 storage practices and food contamination 0.518 and 0.5 respectively. Internal consistency. Test validity had a KMO=0.549 and a Bartlett's test 591.678 , $df=136$.

It is preferable to indicate the number of item in each dimensions.

Answer:

Cleanliness has 4 statements

Storage has 4 statements

Contamination of the child: 2 statements.

This answer can be found in table 1

Results:

More descriptions on the results presented in Table 3 are needed in the manuscript 5.

Answer:

Ninety-five percent of mothers agree that sponges used to wash utensils may be contaminated, and 90.8% state that cloths used to clean surfaces may also contain bacteria and microorganisms. 93.2% consider that the garbage bag can be open as long as the utensils are protected or covered. 99.6% of chopping boards can cause contamination to other products. 74% consider that glass is of high quality for storage; 87.6% consider that utensils would be clean with dishwashing detergent; 84.4% state that food consumption can cause illness in children; 60% consider that if the table where the child consumes food is contaminated, it will also contaminate the food; 62% of mothers or caregivers consider that diarrhea and discomfort in children can have their origin in the food.

Discussion:

The discussion is quite limited. I think more details are needed.

Answer:

In the investigated areas of SJL (San Pablo and Huáscar V), More than half are between 21 and 30 years of age. Their marital status is free union in the majority. The surveyed mothers were mainly housewives and had a secondary education level. The vast majority of households lacked water and sewage services.

Although no significant associations were identified between the variables studied and the level of knowledge of kitchen hygiene, the mothers' education and age in other studies were associated with knowledge of safe food handling and consumption in the home.²¹ In this regard, studies in Africa have shown that caregivers, especially the younger ones, drop out of education or even abandon it, thus affecting their future²². Another study developed in communities in Peru showed an intervention for handwashing in child feeding, where 12% of children were identified and this was increased to 32%²³.

Years of school attendance could improve hygiene knowledge, as well as generating a larger social network in which mothers or caregivers interact. Likewise, having a radio in a large percentage of households can be a channel to increase mothers' knowledge and good practices and to obtain appropriate cooking behaviours, through hygiene educational programs. In other studies, mothers' occupations (homemaker or work

outside the home) was shown to be associated with more satisfactory hygienic practices in relation to food poisoning prevention.^{19,24}

The WHO and the Food and Agriculture Organization of the United Nations mention that unsafe food affects the most vulnerable groups, and to promote the improvement of food safety, they should be kept informed, foodborne diseases can be prevented with optimal handling, some of the measures that we have assessed here in this study, are related to the cleanliness where food is prepared, including avoiding mixing raw and cooked food, the cooking of food should be complete, use of safe raw materials and use of potable water²⁵.

Mother with lower socioeconomic status have been found more likely to experience food products with a high microbial count.²⁶ Our study presented the limitation of not including the microbial count. Studies such as Gil *et al.*, 2014, have shown that this measure has been an accurate indicator to determine families' household cleaning condition.²⁷

Likewise, demographic and socioeconomic factors may have contributed to unsafe food handling behaviours and microbial contamination risks during preparation.²⁸

Poor food handling has been evidenced among low-income consumers.²⁹ Hygiene education, improved treatment, storage and water connections are necessary³⁰.

This study was conducted in a peri-urban area of Lima; some of our limitations may be due to the fact that the entire study population had the same socioeconomic status. Through an evaluation that includes heterogeneous populations, we could obtain complementary results regarding the influence of other variables not examined in the present study, that could improve our understanding of kitchen hygiene knowledge. It is important to highlight that data collection through interviews and surveys is prone to the possibility that the information revealed by the participants may be incomplete or not entirely truthful, which could directly impact the validity of the results.

Conclusion:

The conclusion is also quite limited. A paragraph about preventive and corrective actions is needed.

Answer:

We could not identify a predictive capacity in regard to the level of knowledge of kitchen hygiene in the evaluated sociodemographic characteristics in this sample. Caregivers in these communities should receive more education on treatment, food storage and achieve better health outcomes. Governments are called upon to join the efforts to accelerate efforts to lead education campaigns.

We thank the reviewer for his suggestions for improvement.

Competing Interests: No competing interests were disclosed.

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