Online ISSN : 2249-4618
Print ISSN : 0975-5888
DOI : 10.17406/GJMRA

Global Journal

of Medical Research: K

Interdisciplinary



Discovering Thoughts, Inventing Future

VOLUME 20 ISSUE 5 VERSION 1.0

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Volume 20 Issue 28 was originally issued as K5

Global Journal of Medical Research: K
Interdisciplinary

Volume 20 Issue 28
Originally issued as K5

Global Journal of Medical Research: K Interdisciplinary

Volume 20 Issue 5 (Ver. 1.0)

Open Association of Research Society

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Offset Typesetting

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Global Journal of Medical Research: K
Interdisciplinary
Volume 20 Issue 5 Version 1.0 Year 2020
Type: Double Blind Peer Reviewed International Research Journal
Publisher: Global Journals
Online ISSN: 2249-4618 & Print ISSN: 0975-5888

Results of Hygiene Education of Kitchen Knife by using ATP Inspection - Comparison of Handle and Blade

By Naomi Katayama, Akemi Ito, Mayumi Hirabayashi, Shoko Kondo, Yui Nakayama, Ayari Naka, Natuki Sasaki, Moe Inuzuka & Takashi Tamura

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Abstract- In Japan, the number of food poisoning cases and the number of patients have been gradually decreasing in the last ten years. However, from the Japanese Ministry of Health, Labor and Welfare, the number of bacterial food poisoning cases has been approximately 41% of the total number in the past five years, which is still high. Therefore, in this study, to prevent food poisoning, we conducted hygiene education using the ATP test and confirmed the educational effect by comparing before and after education. ATP luminescence kit (Lumitester PD-10, LuciPac Pen) manufactured by Kikkoman Corporation used for the microbiological test. Before the hygiene education, the ATP of the knife handle, and the ATP of the knife blade measured before and after cooking. Twelve knives for vegetables and 12 knives for meat targeted. Before the hygiene education, the handle and the blade of the meat knife measured of ATP, that before cooking and washed after cooking. Further, the handle and blade of the kitchen knife for vegetables were also measured for ATP in the same manner as the knife for meat.

Keywords: gender; ATP test, the handle of the knife, the blade of the knife, hygiene education, double wash.

GJMR-K Classification: NLMC Code: WA 4



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Results of Hygiene Education of Kitchen Knife by using ATP Inspection - Comparison of Handle and Blade

Naomi Katayama [α], Akemi Ito [σ], Mayumi Hirabayashi [ρ], Shoko Kondo [ω], Yui Nakayama [¥], Ayari Naka [§], Natuki Sasaki [χ], Moe Inuzuka [ν] & Takashi Tamura [Θ]

Abstract- In Japan, the number of food poisoning cases and the number of patients have been gradually decreasing in the last ten years. However, from the Japanese Ministry of Health, Labor and Welfare, the number of bacterial food poisoning cases has been approximately 41% of the total number in the past five years, which is still high. Therefore, in this study, to prevent food poisoning, we conducted hygiene education using the ATP test and confirmed the educational effect by comparing before and after education. ATP luminescence kit (Lumitester PD-10, LuciPac Pen) manufactured by Kikkoman Corporation used for the microbiological test. Before the hygiene education, the ATP of the knife handle, and the ATP of the knife blade measured before and after cooking. Twelve knives for vegetables and 12 knives for meat targeted. Before the hygiene education, the handle and the blade of the meat knife measured of ATP, that before cooking and washed after cooking. Further, the handle and blade of the kitchen knife for vegetables were also measured for ATP in the same manner as the knife for meat. As a result, the ATP value was higher than that before cooking even though both the handles and blades of vegetable and meat knives washed after cooking. After the hygiene education, the handle and blade of the meat knife were measured of ATP, that before cooking and washed after cooking. Further, the handle and the blade of the kitchen knife for vegetables also measured for ATP in the same manner as the knife for meat. As a result, the ATP value was statistically significantly lower than that before cooking by cleaning the handle and blade of both knives after cooking. However, even after the hygiene education, the handle of the meat knife did not have an ATP value of less than 100. It has found that the handle of meat knives needs to be given a more thorough hygiene education before cooking to thoroughly washing.

Keywords: gender; ATP test, the handle of the knife, the blade of the knife, hygiene education, double wash.

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I. Introduction

In Japan, the number of food poisoning cases and the number of patients have been gradually decreasing in the last ten years (2009-2018). The reduction of bacterial food poisoning is implementation. Thorough hygiene management at food manufacturing plants is carried out and increased awareness of hygiene, such as hand washing at home. According to statistical data on food poisoning from the Japanese Ministry of Health, Labor and Welfare, the number of bacterial food poisoning cases has been approximately 41% of the total number in the past five years, which is still high (2014-2018). Some hospitals have already conducted hygiene tests using ATP test kits, and the results have been reported[1,2]. Throughout the hospital, surface wiping test using ATP test kits have shown effectiveness in hygiene education. Because microorganisms are invisible, it is hard to work hygienically. However, the hygiene test using the ATP test kit allows seeing the number of bacteria with our eye, thus improving the hygiene condition on the spot. The control of microorganisms at the cooking site is becoming more and more stringent due to the need to comply with HACCP[3,4]. Japan is a super-aged society. Therefore, there is a need for hygiene management and hygiene education in nursing homes. Especially, hygiene education for cooks in the kitchen emphasized. Reports on educational achievements have also made in recent years[5]. Therefore, in this study, using the ATP test kit, we focused on the kitchen knife most touched by the cooks in the kitchen before and after the hygiene education. The inspection results obtained for both the kitchen knife handle and blade, and for both vegetables and meat.

II. Materials and Methods

a) *Kitchen knife*

The 12 kitchen vegetable knives and 12 kitchen meat knives prepared in the kitchen were stored in the sterilization storage the day before the start of cooking.

b) *ATP inspection procedure*

Each of the 24 cooks carried a kitchen knife for vegetables or meat at the start of their work and bring it

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to the cooking table. Before the education of hygiene, the work start time depends on the working conditions of the cooks. Still, the inspector always performed an ATP inspection before using vegetables or meat with a kitchen knife. Then, each cook finished the work, washed the kitchen knife by himself, and they inspected the ATP inspection by the inspector again. The value of ATP recorded. In the same way, after the education of hygiene, the work start time depends on the working conditions of the cooks. Still, the inspector always performed an ATP inspection before using vegetables or meat with a kitchen knife. Then, each cook finished the work, washed the kitchen knife by himself, and they inspected the ATP inspection by the inspector again. The value of ATP recorded.

c) Hygiene education procedure

i. *Cleaning instruction*

While showing the ATP result before the hygiene education to the cook, ATP inspector wash both the knife handle and the blade firmly with detergent and sponge, wash with water for 30 seconds or more. Then, the inspector washes again both the knife handle and the blade carefully with detergent and sponge, and rinse again with water for 30 seconds or more. The cook tries to do it as same as the inspector dose. Then, the cook tries to do it next cooking. That ATP result of the after education recorded.

ii. *Statistical processing*

The results obtained compared using statistical methods. The compared data was subjected to an F test to determine whether to use a parametric test or nonparametric test. When there is no difference in the F test, the presence or absence of a significant difference was confirmed using the student-t-test with or without a correspondence. If there was a difference in the F test, the presence or absence of a significant difference was confirmed using the Wilcoxon test with a pair or the Mann-Whitney test without correlation.

III. Results

a) Meat knife: ATP results of before hygiene education

i. *Meat knife handle and blade*

The ATP inspection result of the knife handle and blade before hygiene education shown in Table 1 and Table 2. Despite the completion of cooking and washing, the knife blade had a higher ATP average value than before using it. Since both ATP data did not fall below 100 even after cleaning, it can see that self-flow is insufficient for washing.

Table 1: ATP test result of the meat knife handle before cleaning instruction

Meat knife handle	before cleaning instruction	
	before	after
Handle 1	22	550
Handle 2	222	576
Handle 3	16464	706
Handle 4	4268	731
Handle 5	6438	783
Handle 6	723	845
Handle 7	4769	980
Handle 8	1335	1219
Handle 9	1407	2432
Handle 10	581	2438
Handle 11	5448	3084
Handle 12	4807	8123
Average	3873.6667	1872.25
Standard deviati	4581.2532	2147.5009
Median	2837.5	912.5
Maximum	16464	8123
Minimum	22	550

Table 2: ATP test result of the meat knife blade before cleaning instruction

Meatknife blade	before cleaning instruction	
	before	after
Blade 1	52	71
Blade 2	0	90
Blade 3	61	91
Blade 4	84	170
Blade 5	48	291
Blade 6	400	322
Blade 7	116	433
Blade 8	48	610
Blade 9	1982	924
Blade 10	101	1208
Blade 11	40	1468
Blade 12	5	11680
Average	244.75	1446.5
Standard deviatior	557.010221	3255.4904
Median	56.5	377.5
Maximum	1982	11680
Minimum	0	71

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b) Meat knife: ATP results of after hygiene education

i. *Meat knife handle and blade*

The ATP inspection result of the kitchen meat knife handles and blade after hygiene education shown in Table 3 and Table 4. Meat knives after hygiene education had lower average ATP values for both handle and blade than before cooking. In particular, the knife blade had an ATP value of less than 100. It cleaned well.

Table 3: ATP test result of the meat knife handle after cleaning instruction

Meat knife handle	after cleaning instruction	
	before	after
Handle 1	2	13
Handle 2	436	37
Handle 3	38	38
Handle 4	81	39
Handle 5	45	61
Handle 6	146	61
Handle 7	4642	66
Handle 8	2045	94
Handle 9	1221	97
Handle 10	61	158
Handle 11	887	363
Handle 12	3546	540
Average	1095.8333	130.5833
Standard devia	1549.1016	159.0469
Median	291	63.5
Maximum	4642	540
Minimum	2	13

Table 4: ATP test result of the meat knife blade after cleaning instruction

Meat knife blade	after cleaning instruction	
	before	after
Blade 1	9	0
Blade 2	28	6
Blade 3	232	6
Blade 4	232	6
Blade 5	332	6
Blade 6	49	11
Blade 7	804	13
Blade 8	208	28
Blade 9	208	28
Blade 10	2994	46
Blade 11	155	55
Blade 12	104	68
Average	446.25	22.75
Standard deviatio	829.19952	22.474733
Median	208	12
Maximum	2994	68
Minimum	9	0

c) Vegetable knife: ATP results of before hygiene education

i. *Vegetable knife handle and blade*

The ATP inspection result of the kitchen vegetable knife handles and blade before hygiene education shown in Table 5 and Table 6. Despite cleaning after cooking, the knife handle had a higher average ATP value than before cooking. It turned out that self-washing was not hygienic. The knife blade after cleaning was lower than that before cooking, but it did not fall below 100. It is not thoroughly washed.

Table 5: ATP test result of the vegetable knife handle before cleaning instruction

Vegitable knife handle	before cleaning instruction	
	before	after
Handle 1	343	248
Handle 2	88	324
Handle 3	575	424
Handle 4	472	545
Handle 5	867	559
Handle 6	1352	763
Handle 7	4119	903
Handle 8	2581	1210
Handle 9	569	1769
Handle 10	98	3002
Handle 11	402	6856
Handle 12	5163	19136
Average	1385.75	2978.25
Standard deviatior	1678.5821	5416.3923
Median	572	833
Maximum	5163	19136
Minimum	88	248

Table 6: ATP test result of the vegetable knife blade before cleaning instruction

Vegetable knife blade	before cleaning instruction	
	before	after
Blade 1	71	49
Blade 2	84	57
Blade 3	96	59
Blade 4	85	124
Blade 5	38	142
Blade 6	219	159
Blade 7	9	201
Blade 8	19	238
Blade 9	17942	239
Blade 10	68	800
Blade 11	205	1072
Blade 12	135	3582
Average	1580.9167	560.166667
Standard deviation	5152.8196	1003.56572
Median	84.5	180
Maximum	17942	3582
Minimum	9	49

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d) Vegetable knife: ATP results of after hygiene education

Vegetable knife handle and blade

The ATP inspection result of the kitchen vegetable knife handle and blade after hygiene education shown in Table 7and Table 8.

Vegetable knives after hygiene education had lower average ATP values for both handle and blade than before cooking. In particular, both knife handle and blade had an ATP value of less than 100. It was cleaned well more than a meat knife.

Table 7: ATP test result of the vegetable knife handle after cleaning instruction

Vegitable knife handle	after cleaning instruction	
	before	after
Handle 1	6	7
Handle 2	33	10
Handle 3	404	33
Handle 4	712	43
Handle 5	2741	53
Handle 6	63	65
Handle 7	892	92
Handle 8	28	100
Handle 9	56	103
Handle 10	10865	110
Handle 11	1190	126
Handle 12	814	192
Average	1483.667	77.83333
Standard deviation	3055.541	53.37489
Median	558	78.5
Maximum	10865	192
Minimum	6	7

Table 8: ATP test result of the vegetable knife blade after cleaning instruction

Vegetable knife blade	after cleaning instruction	
	before	after
Blade 1	222	4
Blade 2	222	4
Blade 3	42	5
Blade 4	427	6
Blade 5	202	9
Blade 6	103	14
Blade 7	138	17
Blade 8	138	17
Blade 9	51	29
Blade 10	68	31
Blade 11	185	31
Blade 12	93	48
Average	157.583333	17.9166667
Standard deviation	106.289021	14.0224387
Median	138	15.5
Maximum	427	48
Minimum	42	4

IV. Statistical Processing Results

a) Comparison of ATP test values of meat knife handle: before and after education

The results of the statistical comparison of meat knife handle before and after hygiene education shown in Table 7. It can be seen that, in the handle of the meat knife, there is no statistically significant difference in self-washing between before cooking and the cleaning of after cooking. However, there was a statistically significant difference in ATP test values between before cooking and the cleaning after cooking after hygiene education.

Table 7: Statistical comparison results : ATP test results of Meat knife handle before and after cleaning instruction

	before cleaning instrucion		after cleaning instruction	
	before cooking	after cooking	before cooking	after cooking
Average	3873.7	1872.3	1095.8	130.6
Standard deviation	4581.3	2147.5	1549.1	159.0
F test	p = 0.007 * *		p = 0.0001 * *	
Student-t test				
Wilcoxon test	p = 0.388		p = 0.028 *	

* P<0.05, ** P<0.01

b) Comparison of ATP test values of meat knife blade: before and after education

The results of the statistical comparison of the meat knife blade before and after hygiene education shown in the Table 8. Both before and after hygiene education, the knife blades washed before and after cooking had a statistically significantly lower ATP value. However, the ATP value shows that the cleaning effect is more effective after hygiene education.

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Table 8: Statistical comparison results : ATP test results of Meat knife blade before and after cleaning instruction

	before cleaning instrucion		after cleaning instruction	
	before cooking	after cooking	before cooking	after cooking
Average	244.8	1446.5	446.3	22.8
Standard deviation	557.0	3255.5	829.2	22.5
F test	p = 0.0001 * *		p = 0.0001 * *	
Student-t test				
Wilcoxon test	p = 0.034 *		p = 0.002 * *	

* P<0.05, ** P<0.01

c) *Comparison of ATP test values of the vegetable knife handle: before and after education*

The results of the statistical comparison of vegetable knife handle before and after hygiene education shown in the Table 9. It can see that, in the handle of the vegetable knife, there is no statistically significant difference in self-washing between before cooking and the cleaning of after cooking. However, there was a statistically significant difference in ATP test values between before cooking and the cleaning of after cooking after hygiene education. In particular, after hygiene education, the knife handle had an ATP value of less than 100. It cleaned well more than before cooking.

Table 9: Statistical comparison results : ATP test results of vegetable knife handle before and after cleaning instruction

	before cleaning instrucion		after cleaning instruction	
	before cooking	after cooking	before cooking	after cooking
Average	1385.8	2978.3	1483.7	77.8
Standard deviation	1678.6	5416.4	3055.5	53.4
F test	p = 0.007 * *		p = 0.0001 * *	
Student-t test				
Wilcoxon test	p = 0.695		p = 0.034 *	

* P<0.05, ** P<0.01

d) *Comparison of ATP test values of vegetable knife blade: before and after education*

The results of the statistical comparison of vegetable knife blade before and after hygiene education shown in the Table 10. It can be seen that, in the blade of the vegetable knife, there is no statistically significant difference in self-washing between before cooking and the cleaning after cooking. However, there was a statistically significant difference in ATP test values between before cooking and the cleaning of after cooking after hygiene education. In particular, after hygiene education, the knife handle had an ATP value of less than 100 (less than 20). It cleaned well more than before cooking.

Table 10: Statistical comparison results : ATP test results of vegetable knife blade before and after cleaning instruction

	before cleaning instrucion		after cleaning instruction	
	before cooking	after cooking	before cooking	after cooking
Average	1580.9	560.2	157.6	17.9
Standard deviation	5152.8	1003.6	106.3	14.0
F test	p = 0.0001 * *		p = 0.0001 * *	
Student-t test				
Wilcoxon test	p = 0.209		p = 0.002 * *	

* P<0.05, ** P<0.01

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V. Discussion

Hygiene control points that should observed at the cooking site are three principles to prevent food poisoning: to prevent bacterial, to be fussy, and to kill. In this study, bacteria that cannot see with the naked eye are expressed by visible numbers by detecting ATP[6], and by providing hygiene education, it becomes possible to handled knives most accessible to humans in a hygienic manner. The ATP wiping test has been widely used for hygiene management in hospitals and has produced results[7]. Even during cooking, it expected that the hygiene education effect will be high because the bacteria test result can show to the cook as an ATP value within one minute[8]. This time, 24 cooks had kitchen knives for vegetables and meat and had the inspectors measure the ATP value after cleaning the knives before and after cooking. As a result, when the cooks washed their kitchen knives, the ATP value could be lower or higher, and there was no statistically significant difference in the handle of the knives. While showing the results to the cooks on the spot, they showed how to wash the kitchen knife handle and blade with a detergent, and repeated the method of cleaning with running water for 30 seconds twice. After this hygiene education, the cook again cooked using the same kitchen knife and asked the inspector to perform an ATP inspection on the kitchen knife that had washed before and after cooking. After the hygiene education, the handle and blade of vegetables knives and the handle and blade of meat knives all had statistically significantly lowered ATP values, and hygienic cleaning was possible. However, since the handle of the kitchen knife for meat did not have an ATP value of less than 100 even after washing, it was found that more careful washing is necessary. Further guidance to cook is needed.

VI. Conclusions

The purpose was to utilize the ATP test, which used for hygiene tests in hygiene education in the kitchen. An ATP wiping test performed on the kitchen knife handle and blade. Comparison of ATP test values before and after hygiene education in both meat and vegetable knives. As a result of averaging 12 ATP values for each data, and comparing them, before hygiene education, before and after cooking, we compared the handle of the kitchen knife and the blade of it, but it is not said that sufficient cleaning can done. However, after the hygiene education, the handle and blades of knives had a statistically significant lower ATP value than the handle and blades of knives, which had washed after cooking. However, the handle of the meat knife had a higher ATP value than the blade, and it did not become less than 100. On the other hand, the kitchen knife for vegetables has an ATP value of 100 or less after washing both the handle and the blade after hygiene education, confirming the sufficient washing effect. It found that the knife for meat needs to politely washed more politely than the vegetable knife. Cautions in future hygiene education.

Acknowledgments

We would like to thank all the cooks who participated in this experiment. Also, we would like to thank the inspectors who also performed the ATP inspection.

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Global Journal of Medical Research: K
Interdisciplinary
Volume 20 Issue 5 Version 1.0 Year 2020
Type: Double Blind Peer Reviewed International Research Journal
Publisher: Global Journals
Online ISSN: 2249-4618 & Print ISSN: 0975-5888

High Touch Surface COVID-19 Cleaning and Disinfecting: Workforce Health and Safety Preparation

By Skiba, Richard

Abstract- This paper reviews the current accepted practice for high touch surface cleaning and disinfection to kill surface COVID-19 virus such that transmission risks are lowered. Surface cleaning and disinfecting is considered from a workplace perspective, in a non-healthcare setting, and an outline of a worker training program is developed to align with the noted best practices. The program overview presented is based on a competency-based framework and designed in a way such that it can be customised to required environmental circumstances. A practical health and safety training program application is outlined, showcasing adaptation in vocational education and training sector to a current context.

Keywords: *COVID-19, cleaning, disinfecting, health and safety, vocational education.*

GJMR-K Classification: *NLMC Code: WA 240*

HIGHTOUCHSURFACECOVID19CLEANINGANDDISINFECTINGWORKFORCEHEALTHANDSAFETYPREPARATION

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I. Introduction

COVID-19 is a respiratory illness caused by a novel (or new) coronavirus that has not previously been seen in humans that produces a range of symptoms from a mild cough to pneumonia (Queensland Government, 2020; Centers for Disease Control and Prevention, 2020a). While some people recover easily, others may get very sick very quickly, and there is evidence that it spreads from person to person. In COVID-19, 'CO' stands for 'corona,' 'VI' for 'virus,' and 'D' for disease and is caused by a coronavirus called SARS-CoV-2 (Centers for Disease Control and Prevention, 2020a). Since there are no standard treatments for COVID-19, it is imperative to avoid infection or further spreading (Wu, Chen and Chan, 2020).

The Centers for Disease Control and Prevention (2020a) advise that the virus is thought to spread mainly from person to person, primarily through respiratory droplets produced when an infected person coughs or sneezes. They inform that the droplets can land in the mouths or noses of people who are nearby or possibly be inhaled into the lungs. They also suggest that spread is more likely when people are in close contact with one another, which they state is within about 6 feet or approximately 1.8 meters. The virus may spread effortlessly and sustainably in a community, referred to as community transmission, resulting in many infections within a specific geography, whether this is a workplace, communal location or municipality. Fauci, Lane and, Redfield (2020) note that the efficiency of transmission for any respiratory virus has significant implications for containment and mitigation strategies. Aside from social distancing, environmental controls such as effective cleaning and disinfection contribute to mitigation strategies. Reducing the risk of exposure to COVID-19 by cleaning and disinfection is, in particular, an important part of reopening public spaces.

Regarding surfaces and objects, Centers for Disease Control and Prevention (2020a) state that "It may be possible that a person can get COVID-19 by touching a surface or object, like a packaging container, that has the virus on it and then touching their own mouth, nose, or possibly their eyes, but this is not thought to be the main way the virus spreads". The Queensland Government (2020) states that touching objects or surfaces contaminated by cough or sneeze droplets from a person with COVID-19 infection, and then touching the mouth or face can result in the virus spreading. By killing germs on a surface after cleaning, the risk of spreading the virus is lowered (Centers for Disease Control and Prevention, 2020a). Disinfectants kill germs on surfaces and killing germs on a surface after cleaning, lowers the risk of spreading infection.

Public Health England (2020) advises that the risk of infection depends on many factors and, these include the type of surfaces contaminated, the amount of virus shed from the individual, the time the individual spent in the setting, and the time since the individual was last in the setting. European Centre for Disease Prevention and Control (2020) notes that "the environmental stability of SARS-CoV-2 is up to three hours in the air post-aerosolisation, up to four hours on copper, up to 24 hours on cardboard and up to two to three days on plastic and stainless steel, albeit with significantly decreased titres [concentration]".

As a general approach, workplaces should clean surfaces at least daily with special attention given to frequently touched surfaces (Safe Work Australia, 2020). These surfaces, as examples, can include but are not limited to light switches, tabletops, door handles, handrails, desks, toilets, taps, kitchen surfaces, and cupboard handles. Ideally, once clean, surfaces should also be disinfected regularly. The surfaces should be cleaned more frequently when they are visibly soiled,

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used repeatedly by several people or after any spillage. As an example, items such as trolleys, retail checkouts, and EFTPOS machines must be cleaned more frequently due to their high use.

Safe Work Australia (2020) outlines, "when and how often a workplace should undertake disinfection as part of routine cleaning will depend on the likelihood of contaminated material being present at the workplace". They suggest by way of example, in a busy retail environment with many customers and others entering a workplace each day, disinfecting must occur more frequently to prevent the spread of COVID-19. The Centers for Disease Control and Prevention (2020a) advise that cleaning and disinfection should be performed by cleaning staff who are trained on the appropriate use of cleaning and disinfection chemicals and provided with the personal protective equipment (PPE) required for the chemicals used. Personal protective equipment is used to reduce the risk of direct contact with contaminated surfaces.

Two critical aspects are of fundamental requirements for training those workers who are responsible for cleaning and disinfection to remove COVID-19, namely the safety of the worker performing the cleaning activity and the effective removal of the virus from the high touch surface such that there is no opportunity for contact infection.

II. Method

The study is based on a review of primarily of published research and government or government body published findings with respect to COVID-19 cleaning and disinfecting such that best practice can be determined and qualified for training purposes. A broad scope of literature is addressed to establish consensus in processes and these are noted as a baseline for determination of competence for an individual tasked with the responsibility for cleaning and disinfecting high touch surfaces in a non-healthcare setting, such as retail and other workplace environments. As a limitation to the study, it does not aim to produce specialists but rather outline best practices in terms of content for inclusion in a training program.

III. Discussion

Safe Work Australia (2020) defines both cleaning and disinfection, stating that "cleaning means physically removing germs, dirt and organic matter from surfaces". Disinfecting, on the other hand, refers to "using chemicals to kill germs on surfaces. It's important to clean before disinfecting because organic matter and dirt can reduce the ability of disinfectants to kill germs".

In terms of managing COVID-19 in a workplace context, Safe Work Australia advises that a utilizing a combination of both cleaning and disinfection is the most effective way to remove the virus. The cleaning process will reduce the soil load on the high touch surface such that the disinfectant can work to effectively kill the COVID-19 virus. Where the surface is not suitably prepared by cleaning with a detergent first, the disinfectant may not kill the virus.

a) Cleaning Risks and Controls

The Australian Department of Health notes that the risk when cleaning or disinfecting is not the same as the risk when face-to-face with a sick person who may be coughing or sneezing (Department of Health, 2020). To manage the risks associated with cleaning, cleaning staff should be advised to avoid touching their face, especially their mouth, nose, and eyes when cleaning. Utilization of Personal Protective Equipment (PPE) is also critical as a risk control measure, including using impermeable disposable gloves and a surgical mask plus eye protection or a face shield while cleaning. Competent use of PPE is an essential founding component of a training program in COVID-19 Cleaning and Disinfection. As a preparatory exercise before undertaking the cleaning, cleaners should use alcohol-based hand rub before putting on and after removing gloves and, likewise, the hand rub should also be used before putting on and after removing the surgical mask and eye protection.

The Department of Health (2020) advise that cleaners should be aware that surgical mask and eye protection act as barriers to people inadvertently touching their face with contaminated hands and fingers, whether gloved or not. They also note that where there is visible contamination on the surface to be cleaned, such as respiratory secretions or other body fluid, the cleaners should wear a full-length disposable gown in addition to the surgical mask, eye protection and, gloves. All PPE needs to be utilized and correctly fitted in accordance with the relevant manufacturer's instructions, including the corresponding Safety Data Sheet (SDS), and in line with employer policies and procedures. Use of PPE is instrumental in protecting cleaning workers and preventing the spread of COVID-19 and, the World Health Organization recommends staff training on the use of PPE, including masks, doffing procedures, and hand hygiene practices (World Health Organization, 2020).

Training programs should include accessing and reading Safety Data Sheets including correct processes for transporting, storing, handling and disposing of chemicals, cleaning up skills, applying first aid and the hierarchy of controls.

b) Use of Disinfectants

Wu, Chen and Chan (2020), as proposed by the National Environment Agency, Singapore, outline that COVID-19 is susceptible to many active ingredients, including sodium hypochlorite (0.1%–0.5%), 70% ethyl alcohol, povidone-iodine (1% iodine), chloroxylenol (0.24%), 50% isopropanol, 0.05% benzalkonium

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chloride, 1% cresol soap, or hydrogen peroxide (0.5%–7.0%), amongst others. Disinfectants containing greater than or equal to 70% alcohol, quaternary ammonium compounds, chlorine bleach, or oxygen bleach are suitable for use on hard surfaces (Safe Work Australia (2020).

The American Chemistry Council's (ACC) Center for Biocide Chemistries (CBC) has compiled a list of products that have been approved by the U.S. Environmental Protection Agency (EPA) for use against emerging enveloped viral pathogens and can be used during the current novel coronavirus (COVID-19) outbreak (Center for Biocide Chemistries (2020). The list includes ready-to-use sprays, concentrates, and wipes. This list, known as 'List N: Disinfectants for Use Against SARS-CoV-2' and available at https://www.epa.gov/pesticide-registration/list-n-disinfectants-use-against-sars-cov-2, provides an in-depth list of chemical applications and should be included in training for cleaning workers such that they can correctly identify and apply the most suitable chemicals for cleaning and disinfection.

c) Preparation of Chlorine-Based Disinfectant Solution

Chlorine is an effective killer of viruses, however, it should be noted that it can be hazardous for humans, and as such, where possible, safer alternatives should be used. These should be prepared in the correct concentrations with dilutions based on the manufacturer's instructions. During preparations, the concentrate should be added to water rather than water to the concentrate. Diluting solutions is a core component of a training program for cleaners of high touch surfaces, as is their correct use. In terms of their use, they should be applied using PPE, in well-ventilated areas, and not mixed with any other products (Department of Health, 2020). Chlorine solutions should be made up daily and used mainly on hard, non-porous surfaces as it can damage textiles and metals. The Western Australian Department of Health advises avoiding 'topping up' detergent or disinfectant containers as this can lead to contamination of the containers.

d) Cleaning and Disinfection Processes

Queensland Government (2020) recommends that hard surfaces can be cleaned by performing a physical clean using a combined detergent and 1,000ppm bleach solution (2-in-1 clean) made up daily from a concentrated solution. As an alternative, they provide applying a physical clean using detergent and water followed by a clean with 1,000ppm bleach solution (2-step clean), for example, household bleach or hospital-grade bleach solutions that are readily available from retail stores. Household bleach comes in a variety of strengths of the active ingredient, sodium hypochlorite, and this information is located on the product label, often listed as available chlorine. The manufacturer's directions for dilution should always be followed.

Public Health England (2020) advocates the use of disposable cloths or paper roll and disposable mop heads, to clean all hard surfaces, floors, chairs, door handles and sanitary fittings, following one of the options: use either a combined detergent disinfectant solution at a dilution of 1,000 parts per million available chlorine; or, a household detergent followed by disinfection (1000 ppm av.cl.). Follow manufacturer's instructions for dilution, application and, contact times for all detergents and disinfectants; or, if an alternative disinfectant is used within the organization, this should be checked and ensure that it is effective against enveloped viruses. The Centre for Health Protection, Hong Kong, suggest areas with frequent access by members of the public, such as lifts, escalators, lobby entrance, waiting areas, corridors, information counters and, lounges should be leaned and wiped at least twice daily. For frequently touched surfaces such as buttons, handrails, handle, chairs and mailboxes), these should be cleaned and wiped at least twice daily and when visibly soiled. They also suggest cleaning the exhaust fan inside lifts regularly (Centre for Health Protection, 2020).

Training should also provide the knowledge and skills necessary to identify the surfaces to be cleaned and disinfected and the most suitable methods to do so. Some surfaces only need to be cleaned with soap and water such as those that are not frequently touched. They should be cleaned and do not require additional disinfection (Centers for Disease Control and Prevention, 2020b). The Centers for Disease Control and Prevention also notes that disinfectants also should typically not be applied on items used by children, particularly any objects that children might put in their mouths as many disinfectants are toxic when swallowed. With regard to disinfection, each environment will have different surfaces and objects that are frequently touched by multiple people, and selection of the correct cleaning products and procedures is fundamental in their effectiveness, especially with soft and porous material or items like carpet, rugs, or seating in areas.

e) Disposal or Cleaning of Materials and Personal Protective Equipment

Cleaning equipment, including mop heads and cloths, should be laundered using hot water and entirely dried before re-use (Queensland Government, 2020). Cleaning equipment, such as buckets, should be emptied and cleaned with a new batch of chlorine bleach solution and allowed to dry completely before re-use. Safe Work Australia (2020) advises that reusable, washable cloths, PPE, and covers should be washed in a regular cycle wash using the warmest possible setting with normal washing detergent. These should not be

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shaken out before being placed in the washing machine. Disposable gloves should be worn to handle cloths, PPE, and covers, and workers should thoroughly wash their hands with soap and water for at least 20 seconds after removing the gloves (Safe Work Australia, 2020). The hamper used to store used PPE must also be regularly washed and, where it is not washable, a disposable lining should be utilized and replace consistently. Regarding reusable, non-washable PPE such as eye protection, these must be wiped clean with a detergent solution, then wiped over with a disinfectant. Once they are disinfected, they should be left to air dry.

Public Health England (2020) suggests that your waste should not be placed in communal waste areas until the waste has been stored for at least 72 hours.

f) Vocational Education and Training Contexts

Vocational education and training varies in its implementation from country to country. In some geographies, it is highly regulated and nationalized, in others, it is subject to accreditation, which may be compulsory or voluntary, and in some, there are no controls in place at all with training providers defining their own competency standards. For countries with developed competency standards, suitable competencies should be selected and customized to include COVID-19 cleaning and disinfection. Where no such standard or requirement applies, training providers should develop their programs around identified best practices. In either case, worker health and safety are the foundation on which the program should be constructed.

The Australian vocational education and training sector utilizes nationally recognized units of competency as a basis. Units of competency, where packed following packaging rules, can form qualifications that Registered Training Organisations can be registered to deliver. Individual units can also be added to a training provider's scope of registration. Within the range of units available within the national framework, the unit of competency 'CPPCLO3045 - Clean high-touch surfaces' from the CPP Property Training Package lends itself well as a basis for a training program for those providing cleaning for cleaning and disinfecting environments outside of a healthcare setting. The unit can be customized for the inclusion of cleaning and disinfecting with COVID-19 in mind.

Similarly, the New Zealand Qualifications Framework based unit standard '29389 Apply specialised knowledge of infection control and contamination prevention when working as a cleaner', outcomes can be utilized and adapted with COVID-19 cleaning and disinfecting content to develop a program for New Zealand based training providers. The City and Guilds unit 'Unit 111 Clean surfaces using correct methods' provides a basis for a training program for delivery in England, Wales, Scotland and Northern Ireland, for providers utilizing these standards.

Generally, vocational education and training systems are adaptable in a manner that facilitates contextualization, especially where health and safety are concerned. Training providers can use competency specifications to ensure that nationally agreed standards can be applied to the programs they deliver.

g) Competency-Based Performance Criteria

To successfully prepare workers engaged in high touch surface COVID-19 cleaning and disinfecting, the following performance criteria are proposed for inclusion in a competency-based program:

- Specific work requirements and instructions are obtained and interpreted.
- High touch surfaces and soil types are identified and assessed.
- Best practice COVID-19 cleaning techniques are identified.
- Best practice COVID-19 disinfecting techniques are identified.
- Required cleaning techniques are selected and confirmed.
- Work site hazards are identified.
- Risks associated with failing to follow infection control procedures are identified.
- Risks are controlled according to organizational, legislative, and health and safety requirements.
- Obtained and referred to Safety Data Sheets.
- Equipment is selected according to the area to be cleaned and/or disinfected and, checked for serviceability and cleanliness before use.
- Cleaning solutions are selected and prepared according to surface and soil to be cleaned and work requirements.
- Suitable known disinfectants for use against SARS-CoV-2 are selected and prepared according to surface to be disinfected, and work requirements.
- Alcohol-based disinfectants (ethanol, propan-2-ol, propan1-ol) in concentrations of 70-80% are prepared.
- Tasks are sequenced following best practice and organizational procedures to ensure hygiene and efficiency in the completion of cleaning tasks.
- Personal protective equipment (PPE) is carefully chosen and used according to manufacturer specifications, and health and safety and organizational requirements.
- Loose soil and debris are removed from surfaces using required cleaning equipment and techniques.
- Required cleaning solution is applied to surfaces using correctly prepared cleaning equipment, and allowed to dwell according to manufacturer specifications.

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- Surfaces are rinsed free of residual cleaning solutions where required using selected equipment and techniques.
- Moisture is removed from surfaces and allowed to air dry according to task requirements.
- Required disinfecting solution is applied to surfaces using correctly prepared disinfecting equipment, and allowed to dwell with requisite exposure time.
- Unused cleaning solutions are stored or disposed of according to manufacturer specifications, and health and safety, and organizational requirements.
- Equipment and PPE are cleaned, safety checked, and stored or disposed of according to manufacturer specifications and environmental, health and safety, and organizational requirements.

IV. Conclusion

Effective cleaning and disinfection of high touch surfaces is a significant contributor to minimizing the spread of COVID-19. To be performed effectively, recognized, and best practice techniques should be utilized, and the workers applying the cleaning and disinfecting must be adequately protected. A well laid out training program is essential for these workers.

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Global Journal of Medical Research: K
Interdisciplinary
Volume 20 Issue 5 Version 1.0 Year 2020
Type: Double Blind Peer Reviewed International Research Journal
Publisher: Global Journals
Online ISSN: 2249-4618 & Print ISSN: 0975-5888

Results of Hygiene Education of Kitchen Cutting Board by using ATP Inspection - Comparison of Vegetable Cutting Board and Meat Cutting Board

By Naomi Katayama, Mayumi Hirabayashi, Akemi Ito, Shoko Kondo, Yui Nakayama, Ayari Naka, Natuki Sasaki, Moe Inuzuka & Takashi Tamura

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Abstract- Since bacteria grow in high temperature and high humidity, bacterial food poisoning frequently occurs from the rainy season to summer. In Japan, the number of food poisoning cases is high from June to October. Maintaining a hygienic environment in the kitchen is very important for preventing food poisoning. In particular, cutting boards on which various foods are places may cause secondary pollution. Therefore, to avoid food poisoning, this study compared the ATP value of the cutting board before and after the hygiene education using the ATP wiping test and investigated the educational effect. Before hygiene education, the inspector conducted an ATP wiping test on the cutting boards for vegetables and meat that washed before and after cooking and notified the cooks of the values. The inspector conducted hygiene education while showing the cook how to clean the cutting board. The cutting board washed with detergent and sponge, rinsed with running water for 30 seconds or more, then this process was repeated twice.

Keywords: *gender; ATP wiping test, Cutting board, Hygiene education, double wash.*

GJMR-K Classification: *NLMC Code: WA 4*



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Keywords: gender; ATP wiping test, Cutting board, Hygiene education, double wash.

I. Introduction

In Japan, bacterial food poisoning frequently occurs from the hot and humid rainy season to summer. This season is because bacteria are high temperature and humid and tend to multiply. The number of past food poisoning notifications to the Japanese Ministry of Health, Labor, and Welfare tends to be high from May to October. Alao, these numbers are only those delivered to Public Health Center, so it presumed that they are higher. The number of outbreaks of salmonella, vibrio parahaemolyticus, Escherichia coli, etc., which were the representative bacteria for food poisoning has been decreasing year by year. In contrast, no decrease in bacterial food poisoning due to Campylobacter has been observed, and 60% or more of the bacterial food poisoning cases have observed. Hygienic handling of food is needed. Furthermore, to prevent cross-contamination, sanitary handling of cooking utensils, especially cutting boards on which various foods placed, must be ensured. However, the problem is that the bacteria are so small that they cannot be seen. Since the microorganisms are invisible, it is not possible to see if the cooking utensils are hygienic just by looking at them during cooking. Hospitals perform ATP wiping tests when performing hygiene management, and use the number of microorganisms as a visible ATP value to help protect the sanitary environment[1,2]. Also, the ATP wiping test can be used in kitchens to help maintain a hygienic environment[3,4]. It has also reported that it is useful to provide hygiene education for staff using the ATP wipe test[5]. Therefore, in this study, we performed an ATP wiping test on cutting boards that are susceptible to secondary contamination from various foods in the kitchen and compared the ATP values before and after hygiene education.

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II. Materials and Methods

a) Kitchen cutting board

The 12 kitchen vegetable cutting board and 12 kitchen meat cutting board prepared in the kitchen were stored in the sterilization storage the day before the start of cooking.

b) ATP inspection procedure

Each of the 24 cooks carried a kitchen cutting board for vegetables or meat at the start of their work and bring it to the cooking table. Before the education of hygiene, the work start time depends on the working conditions of the cooks. Still the inspector always performed an ATP inspection before using vegetables or meat with a kitchen cutting board. Then, each cook

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finished the work, washed the kitchen cutting board by himself, and they inspected the ATP inspection by the inspector again. The value of ATP recorded. In the same way, after the education of hygiene, the work start time depends on the working conditions of the cooks. Still the inspector always performed an ATP inspection before using vegetables or meat with a kitchen cutting board. Then, each cook finished the work, washed the kitchen cutting board by himself, and inspected the ATP inspection by the inspector again. The value of ATP recorded.

c) *Hygiene education procedure*

i. *Cleaning instruction*

While showing the ATP result before the hygiene education to the cook, ATP inspector washes the cutting board firmly with detergent and sponge, rinse with running water for 30 seconds or more. Then, the inspector repeated this process twice. The cook tries to do it as same as the inspector did. Then, the cook tries to do it next cooking. After the education of ATP value was scored.

ii. *Statistical processing*

The results obtained were compared using statistical methods. The data was statistically processed, was subjected to an F test to determine whether to use a parametric test or nonparametric test. When there is no difference in the F test, the presence or absence of a significant difference was confirmed using the student-t-test with or without a correspondence. If there was a difference in the F test, the presence or absence of a significant difference was confirmed using the Wilcoxon test with a pair or the Mann-Whitney test without correlation.

III. Results

a) *Before hygiene education: Vegetable cutting board and meat cutting board*

Tables 1 and 2 show the results of ATP wiping tests on cutting board for vegetables and meat before hygiene education. It can see that the average value of the ATP values measured after washing before and after cleaning, this data is significantly lowers the ATP value. However, even after washing, the ATP value did not drop below 100 for both vegetables and meat.

Table 1: ATP test result of the vegetable cutting board before cleaning instruction

Vegitable cutting board	before cleaning instruction	
	before	after
Ctting board 1	522	219
Ctting board 2	1234	20
Ctting board 3	1447	22
Ctting board 4	1548	30
Ctting board 5	1771	34
Ctting board 6	1154	18
Ctting board 7	201	146
Ctting board 8	230	194
Ctting board 9	516	128
Ctting board 10	1315	216
Ctting board 11	1554	30
Ctting board 12	1941	646
Average	1119.42	141.917
Standard deviatic	602.085	178.313
Median	1274.5	81
Maximum	1941	646
Minimum	201	18

Table 2: ATP test result of the meat cutting board before cleaning instruction

Meat cutting board	before cleaning instruction	
	before	after
Ctting board 1	798	131
Ctting board 2	928	31
Ctting board 3	1091	590
Ctting board 4	1239	617
Ctting board 5	1290	34
Ctting board 6	2613	51
Ctting board 7	528	404
Ctting board 8	578	379
Ctting board 9	682	127
Ctting board 10	964	73
Ctting board 11	2220	2781
Ctting board 12	869	281
Average	1150	458.25
Standard deviatio	642.163	761.099
Median	946	206
Maximum	2613	2781
Minimum	528	31

b) *After hygiene education: Vegetable cutting board and meat cutting board*

Tables 3 and 4 show the results of ATP wiping tests on cutting board for vegetables and meat after hygiene education. It can see that the average value of the ATP values measured after washing before and after cleaning, this data is significantly lowers the ATP value. After washing, the ATP value was drop below 100 for both vegetables and meat. Both the cutting boards was very hygienic.

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Table 3: ATP test result of the meat vegetable cutting board after cleaning instruction

Vegitable cutting board	after cleaning instruction	
	before	after
Ctting board 1	566	15
Ctting board 2	116	239
Ctting board 3	1147	121
Ctting board 4	224	60
Ctting board 5	1228	25
Ctting board 6	359	75
Ctting board 7	1338	8
Ctting board 8	1323	38
Ctting board 9	1663	60
Ctting board 10	1382	108
Ctting board 11	444	158
Ctting board 12	165	133
Average	829.583	86.6667
Standard deviatio	565.556	68.1767
Median	856.5	67.5
Maximum	1663	239
Minimum	116	8

Table 4: ATP test result of the meat cutting board after cleaning instruction

Meat cutting board	after cleaning instruction	
	before	after
Ctting board 1	282	76
Ctting board 2	283	33
Ctting board 3	404	6
Ctting board 4	1451	10
Ctting board 5	546	29
Ctting board 6	565	51
Ctting board 7	167	28
Ctting board 8	1573	51
Ctting board 9	247	146
Ctting board 10	1527	69
Ctting board 11	900	436
Ctting board 12	465	89
Average	700.833	85.3333
Standard deviatio	528.527	116.985
Median	505.5	51
Maximum	1573	436
Minimum	167	6

IV. Statistical Processing Results

a) *Comparison of ATP test values of vegetable and meat cutting boards: before and after education*

Before and after hygiene education, the results of the ATP wiping test on vegetable and meat cutting boards statistically compared. The results shown in Tables 5 and 6. There was a statistically significant difference in the ATP wiping test values after hygiene education for the cutting board for vegetables and meat. Although there was a statistically significant difference even before hygiene education, the ATP wiping test values for vegetables and meat was not less than 100, so it can say that hygiene is still insufficient.

Table 5: Statistical comparison results : ATP test results of vegetable cutting board before and after cleaning instruction

Vegitable cutting board	before cleaning instrucion		after cleaning instruction	
	before cooking	after cooking	before cooking	after cooking
Average ± Standard deviation	1119.4±602.1	141.9±178.3	829.6±565.6	86.7±68.2
F test	p =0.0001**		p =0.0001**	
Student-t test				
Wilcoxon test	p =0.002*		p =0.004**	

* =p<0.05 , ** =p <0.01

Table 6: Statistical comparison results : ATP test results of meat cutting board before and after cleaning instruction

Meat cutting board	before cleaning instrucion		after cleaning instruction	
	before cooking	after cooking	before cooking	after cooking
Average ± Standard deviation	1150.0±642.2	458.3±761.1	700.8±528.5	85.3±117.0
F test	p =0.283		p =0.0001**	
Student-t test	p =0.008**			
Wilcoxon test			p =0.002**	

* =p<0.05 , ** =p <0.01

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V. Discussion

The ATP wiping test reveals the ATP value within 1 minute, and it is possible to know the number of invisible bacteria[6,7]. For a reason, it used in facilities such as hospitals that require hygiene management[8], this time, focusing on the cutting board of the kitchen. We conducted an ATP wiping test, the ATP values measured before washing and after washing after cooking. Before hygiene education, ATP values for vegetables and meat decreased after washing but did not fall below 100. However, after the hygiene education of washing the cutting board twice, the ATP value was less than 100 when washed, and it was clean. The important thing is that the cutting board is filed with various food material many times a day, so it is necessary to clean it every time. However, since microorganisms are invisible, there is a risk of neglecting cleaning. It is time-consuming to wash twice in busy work, but it is necessary to do it. According to the Japanese Ministry of Health, Labor, and Welfare, the number of food poisoning cases was 1330 in FY2019, the number of patients was 17,282, of which 3 were fatal cases. The breakdown of the number of patients due to food poisoning by the facility was the top three, with 50.4% for restaurants 16.0% for caterers and 11.7%for business establishments. But the hospitals was 0.6%. Since food poisoning will cause many patients to occur once, it is necessary to pay close attention to hygiene management. Since hygiene education by the ATP wiping test is useful, it is need to carry out regular inspections and call attention.

VI. Conclusions

Using the ATP wipe test, the effects of hygiene education were compared by ATP value on the cutting boards, which are likely to cause secondary contamination from various foods in the kitchen. Each of the 24 cooks carried a kitchen cutting board for vegetables or meat at the start of their work and prepare it to the cooking table. The inspector conducted an ATP wipe inspection on the cutting boards for vegetables and meat. The ATP values of the cutting board washed before and after cooking before hygiene education were compared. There was a statistically significant difference even before hygiene education, the ATP wiping test values for vegetables and meat was not less than 100, so it can say that hygiene is still insufficient. The cook learned how to wash the hygienic cutting board twice according to the instructions of the auditor, and cooked again. Then, the inspector again inspected the cutting board. The results, there was a statistically significant difference in the ATP wiping test values after hygiene education for the cutting board for vegetables and meat. After washing, the ATP value was drop below 100 for both vegetables and meat. Both the cutting boards was very hygienic. It found that hygiene education for preventing food poisoning in the kitchen can effectively performed by making invisible bacteria visible numerically as the ATP value by the ATP wiping test.

Acknowledgments

We would like to thank all the cooks who participated in this experiment. Also, we would like to thank the inspectors who also performed the ATP inspection.

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Global Journal of Medical Research: K
Interdisciplinary
Volume 20 Issue 5 Version 1.0 Year 2020
Type: Double Blind Peer Reviewed International Research Journal
Publisher: Global Journals
Online ISSN: 2249-4618 & Print ISSN: 0975-5888

Prevalence and Pattern of RTA among Young Adult Tri-wheeler Drivers in a South-Western City, Lagos, Nigeria

By Dr. Okoro Austin Chigozie

Introduction- A Road Traffic Crash is an event or occurrence that cause morbidity, mortality or destruction of goods or property, due to movement of a vehicle and happened when the vehicle is in motion on the motorway or still moving after veering off the motorway. (1)The use of tri-wheeler as a means of transportation in Lagos commenced in recent times, especially in the high-brow cities of Lagos Island areas (2) As a vehicle for transportation, it had been involved frequently in road traffic accidents with variable degrees of resultants injuries. (2) The ban of commercial Motor Cycles called 'Okada' in some routes in Lagos (3) gave rise to the massive increase in the use of Tri-cyclist for transportation to to many residents in the state.

Motorcyclist cause lots of health problems mostly as RTA which are of high morbidity and mortality. (4) A commercial motorcycle popularly called 'Achaba'/'Okada' in Nigeria is a condition in which a driver conveys an individual or goods for a fee. (4) RTI due to motorcycle riding contributes to the burden of health and seems not properly researched or monitored in LMICs with no programs to tackle the menace. (5) They are ranked high among the risk factors of mortality and morbidity, the main victims being the driver, the person(s) being conveyed and the person walking on the road in the age group 15-29years. (5)

GJMR-K Classification: NLMC Code: WA 108



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Prevalence and Pattern of RTA among Young Adult Tri-wheeler Drivers in a South-Western City, Lagos, Nigeria

Dr. Okoro Austin Chigozie

I. Introduction

A Road Traffic Crash is an event or occurrence that cause morbidity, mortality or destruction of goods or property, due to movement of a vehicle and happened when the vehicle is in motion on the motorway or still moving after veering off the motorway. (1)The use of tri-wheeler as a means of transportation in Lagos commenced in recent times, especially in the high-brow cities of Lagos Island areas (2) As a vehicle for transportation, it had been involved frequently in road traffic accidents with variable degrees of resultants injuries. (2) The ban of commercial Motor Cycles called 'Okada' in some routes in Lagos (3) gave rise to the massive increase in the use of Tri-cyclist for transportation to to many residents in the state.

Motorcyclist cause lots of health problems mostly as RTA which are of high morbidity and mortality. (4) A commercial motorcycle popularly called 'Achaba'/'Okada' in Nigeria is a condition in which a driver conveys an individual or goods for a fee. (4) RTI due to motorcycle riding contributes to the burden of health and seems not properly researched or monitored in LMICs with no programs to tackle the menace. (5) They are ranked high among the risk factors of mortality and morbidity, the main victims being the driver, the person(s) being conveyed and the person walking on the road in the age group 15-29years. (5)There are strong findings that adolescent and young adult drivers are very vulnerable to increased mortality due to RTA because of youthful exuberance, alcoholism, substance use and abuse. (6) A chief means of conveying people and goods and very ubiquitous. (4) Unfortunately, the rise of 'Okada' has been associated with rise in misdemeanours, traffic offences, and poor driving judgements and RTAs resulting in strong criticisms with resultant laws preventing them from plying the roads in some parts of the urban centers.(4)

Tri-Wheelers are a form of IPT. (7) IPT refers to vehicles the occupy the space between personal transporters and government established transportations in urban centers. (7) It was first introduced in Lagos as a means of transportation by the former Administrator Military, Colonel Burba Marwa and it was called 'Keke Marwa' then.(8) It is called 'rickshaw' or 'tuk-tuk' in Asia,(7) and 'Raksha' in Sudan.(2) Worldwide, 'Keke Marwa' or 'Tuk-tuk' contributes to IPT. Keke Marwa is of less power when compared to Motorcycle or other motors with 2 or 4 stroke machines. (9) It has a metallic body covered by tarpaulin and with blinds on the sides. (10) 'Keke Marwa' has two compartments, the front and the rear compartments. (10) The driver's compartment in front houses the seat, handle bar with the shifting gear and clutch lever on the left and throttle on the right, and a single pedal for the brake. (10) The windscreen in from protects the driver from harsh weather conditions like rain, sun, winds, sandstorms and etc., thereby ensuring proper visibility. (10) The rear compartment has a space for keeping small good as well as seat for the passengers. (10) The recent increase in the number of three-wheelers popularly called "Keke NAPEP" or 'Keke Marwa' was as a result of its sheer size that allows closer movement to homes, and ability to move through and in-between vehicles, moves on even poor road conditions and very accessible. (11)

'RTC is an emergent problem of health worldwide and has now been seen and noted as a global phenomenon that was not given its due attention in research and funding thereby affecting every region in the world with its attendant consequences, mortalities, morbidities and disabilities. (1)It contributed 2.1% of the total mortalities in the world, as well as 21% of injuries worldwide, (1) and LMICs contribute about four-fifth of these mortalities. (1) 'RTAs are a recognized cause of trauma worldwide especially in Nigeria where one out every three Nigerian is at risk of being killed or getting injured in RTA'. (12)In the past 30 years in Nigeria, RTA has been very worrisome to the public health specialist and the world at large. (13)There was estimated 53,897 RTAs with 7,717 mortalities in 1976 alone. This number dropped to 5,114 RTAs in 1981 but with rise in mortalities to about 10, 236 with a mean RTA of 96 and nothing has improved to reduce these figures in the years after. (13) 'Mortality has been increasing as the death from RTA between 1990-2005 rose to 28,253.(13)

'RTIs are a huge source of morbidities, mortalities and disabilities worldwide.(14)More so, the WHO predicted that mortalities due to RTA will rise by over four-fifth from year 2000 to 2020.(14)Worldwide, RTI

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ranks 9th among top contributors to DALYs and this could rise to third by 2020. (14) Sadly, RTA contributes to about 96% of mortality in children. (14) The effect of RTA is rising faster in LMICS due to increase in numbers of vehicles and other determinants. (14) It specifically affects adolescents, young adults and adults of age range 15-44years as well as young male and female children in whom there are high mortalities. (14) The global figure is believed to be undervalued because of the paucity of accurate and organized information from regions with higher RTI deaths and disabilities. (14)

In a study by Ipingbemi and Adebayo(9), they found out that all the operators of three-wheeler were males, 73.4% (9) had no more than secondary education and only 35.4% (9) of the drivers had current operational documents. As the number three-wheelers on the roads rise, it comes with attendant RTA due to poor vehicle maintenance, poor road maintenance, non-adherence to traffic rules and regulations like speed limits, weather conditions causing visual disturbance and etc. (10) Effects due to characteristics of individual riders in RTA are determinants that affect the riders and other persons using the road and these include their socio-demographic characteristics, systemic, attitudinal, psychologic and environmental influences. (15) 'Poor vehicle maintenance including continual use of old vehicles have been identified in Ethiopia and Libya'. (15) 'The prevalence of drug abuse among Motorcycle drivers in a Northern Nigerian city was 19.3%'.(16)

a) Statement of the Research Problem

There has been some research on Tri-Wheelers in Nigeria but with very little evaluation of its contribution to data on RTA among tri-wheeler drivers. 'It is believed to be safer when compared to Motorcycles(9) even though is known to be involved in RTAs with attendant RTI, disability and death'.(2) In a study by Balami and Sambo on tricycle in a Northern city in Nigeria, there was a prevalence of 40% with less than 10% did not have organized schooling. (18.7%). (15) 31.7% of the participants had visual impairment. (15) The study was done in a metropolitan city with a population of 540,016 (15) in contrast to the estimated population of 21 million (17) in Lagos State with a population density of 6,871 persons per sq. Km (17,800 per sq. mile). (17) 'Lagos is the city with the highest human population in Africa with interconnecting roads and bridges'. (17)

Also, the pattern of injuries were not determined in the study and the association of age with RTA was not determined too. This study will estimate the prevalence of RTA among the tri-wheeler drivers in Victoria Island, Lagos a Southern City in Nigeria, the risk factors associated with the accidents among young drivers as they are more prone to risky behaviours (6) and also identify the type of injuries associated with tri-wheeler accidents. The African Youth Charter stipulates 15-34 years old as 'Youth' (18), hence this study will focus on this age group.

II. Literature Review

a) Global View

A WHO working committee defined accident as 'unforeseen conditions, situations or actions causing tangible or noticeable negative effect, damage or trauma while RTA refers to occurrence of such condition or event, with the involvement of one vehicle or more, on a motor way or in publicly accessed area resulting in the death or injury to one person or more while purposeful acts and non-man-made events are not included. (19) RTAs are one of the topmost factors that lead to mortality in younger age groups and young adults. (6) Socio-demographic and topographic conditions are determinants of mortality and morbidity as a driver, passenger, motorcycle driver, bicycle rider, or person walking on the road. (6) 'RTA fatality is defined as any death occurring following RTA or 30 days after a fatal accident'. (20) It is 25.3 per 10,000 vehicles. (20) 'In a study in Switzerland, 1620 Mortalities due to RTC were analyzed and there were 978 (60.4%) in motor drivers and passengers, 254 (15.7%) in motorcycle drivers, 107 (6.6%) in bicycle riders, and 259 (16.0%) in persons walking on the road. (6) RTA account for nearly 10% to 30% of the hospital registrations in India and it is ranked sixth among the causes of mortality in India'. (20) 'Majority of the victims are from rural background and includes adolescents, young adults and adults of age range 15 to 44 years. (20)

In October 2005, the UNGA called for the first 'Global Road Safety Week' with the Assembly Resolution A/60/5 to promote road safety worldwide. (21)The topic was titled "Young Road Users" –because of increased vulnerability of young people to RTA leading to mortality, morbidity and disability. (21). 'In the European region, RTI is one the leading causes of mortality from violence and unintentional injuries (127,000 deaths per year) among children'. (22) 'RTIs and injury in water bodies contribute about nearly 50% of Road traffic injuries and drowning together account for nearly half of all child mortalities due to unintentional injuries. (22) More so, many more children in numbers up millions undergo hospital admission for non-fatal injuries with many developing chronic and prolonged disabilities. (22) RTI tops the contributors to mortality among older children and adolescents of age 10-19years. (22) More than half of the death due to RTA worldwide involve adolescents, young adults and adults in the age range of 15-44 years. (22) This is a very active and productive age group.

There is a projection that by 2020, RTI will be the third leading cause of DALYs. (22) In developing countries, RTA cause 1.3 million mortalities and 50 million RTIsper year. (23) '85% of global crashes occur

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in LMICs. (23) India ranks topmost with 100,000 mortalities annually seconded by the Chinese with 87,000 deaths annually. (23) It is projected that by 2020,67% of the mortalities due to RTA will be accounted for in Asia.(24)'In East-Asian and South-East Asian countries, over 67% of affected persons are motorcycle riders.(24) Behavioural factors are the major determinants of RTA.(24)'In a study by Spoerri and colleagues, 82.1% drove vehicle without a license'. '75.7% did not know the side of the road to be used by pedestrians for walking'.(6) 'Only 15.7% could recognize all 5 traffic signals properly'.(6) 'Nearly 95.7% agree that helmets prevent accident, but only 37.5% use helmet/seat belt regularly'.(6) 'Human factor is the a major determinant of RTA and can contribute to about 80% to 98%.(24) Behaviour of a driver while on the road is a major contributor to rising number of RTAs and it exposes the weakness of the factors attributable to people.(24)Increasingly, more vehicles, bad roads, poor and corrupt enforcement, population increase, and weather conditions, contribute to RTA in LMICs.(25)'A study in Sri-Lanka found three factors were positively associated with RTA among for-hire three-wheeler crashes'.(26) 'They were as follows: Over-loading of passengers (> 3 in the seat), old and poorly maintained tricycles, and being convicted by law enforcement agents for offences bothering on road codes and regulations during the past 12 months'.(26)

In India, Transportation on road has been a major consumer of hydrocarbons in the form of premium motor spirit and gas with importation as a major means of meeting up with the energy demands.(27) 'Most of India's population prefers private and para-transit transportation and this has impacted on the economy leading to increased mobility share from 16.2% in 1990-1991 to 21.2% in 2000-2001, respectively, (27) with decline in the use of shared means of transportation like buses and railways in the same period.(27) Auto-rickshaws have a huge rise in per capita mobility of 130% in road transportation.(27)

b) Regional Perspective

'WHO estimated that 33% of all modes of transport in sub-Saharan Africa are motorcycles and three-wheelers'.(28)Worldwide, among adolescents and young adults aged 15-29years, RTIs, is the commonest cause of mortalities.(29) In the region, the number of RTI and mortalities have been increasing over the past 30years.(29)'According to the report on road safety published in 2015 for the second preceding year (2013), the region has the most cases of mortalities from RTI in the world with prevalence of 26.6 per 100 000 persons.(29) The use of motorcycles has increased greatly in Africa in recent years.(28) Motorcycles are often used commercially to convey people and goods for a fee.(28) 'Attempts for proper regulation of the activities of Motorcycle riders have largely failed, as the authorities could not keep pace with the massive influx of motorcycles into the continent and the high demand for their services by local populations'.(28) Similar issues apply to motorized three-wheelers, although their numbers are far fewer.(28)

Mortality on the road measured annually in South Africa showed that the rate is 43 per 100, 000 population and this is an inappropriate increase when compared to 22 deaths per 100,000 persons which is the mean for the world.(30)Effects of RTC in South Africa is shown to be on the rise with 13,802 Mortalities from RTCs in 2011.(31)The new mortalities due to RTC was then estimated to be 27.5 per 100,000 persons.(31)A study in Ghana showed a mortality rate of six per day due to RTA.(32) This study also showed that 25% of the pedestrian mortalities were children and identified over-speeding as a risk factor in 60% of RTAs.(32) In a study in South Africa with population size of 305, showed that 100 participants were admitted with 45 Mortalities due to RTC in the given period.(31) On admission, Pedestrians were 41 in number and 59 motor occupants.(31)Most involved (n=58) private vehicles.(31)Only 17% of motor occupants wore seat-belt while 8 were drunk or under the influence of alcoholism.(31)Air and rail transport are either prohibitive, unreliable or poorly maintained in the African region, hence road transportation becomes desirable and the only source of conveying people and goods from one point to the other. (29) But there has not been any corresponding increase in road infrastructures even as the population increases, thus more people are exposed to hazards on the road'. (29) RTCs already kill more young people aged 17-25 years than any other cause.(28)Findings from the 1999 Transport Research Laboratory report,(33) "Estimating Road Fatalities," revealed that South Africa and Nigeria accounted for more than 50% of mortalities due to RTA in the Africanregion.(33)

'Injuries sustained by motorcycle and three-wheeler riders tend to be more serious than those sustained by four-wheeled vehicle occupants, with common serious injuries including head injuries and injuries to the lower extremities including the pelvic region'.(28)The approval of motorcycles led to involvement of more individuals as motorcyclist in Tanzania with attendant increase mortalities due to RTA from 309 in 2008 to 1,098 in 2013'.(28) In Dar-es Salaam, there was an worsening rate of RTA of 4.3% between 1999 and 2000 and 2.7% during 2000 and 2001. 'The total number of traffic accidents was 16372 during these 3 years'.(34)'In a study conducted in Ethiopia to assess the risky driving behavior among drivers, the mean age of the respondents was 28.7years'.(35)'About 66.65 had risky behaviours.(35) 42.3% used phones while driving while 9.7% was under the influence of alcohol'.(35) A study to assess three-wheeler induced accidents in Khartoum, Sudan showed a prevalence of 52.7% with tricycle somersault and

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being hit by a vehicle as the most common type of RTA.(2) 'Majority had injury that affected many body parts while the commonest injury was soft tissue injuries.(2) Also driver-owners were less involved in accidents compared to driver-employees'.(2)'Delays in implementing road safety policies in LMICs has been adjudged as one of the factors contributing to RTCs and increase the DALYs'.(36)

c) Local Aspect

'RTAs cause huge economic losses to Nigeria and cast a significant burden on the health of the populace as well as the ability of the healthcare industry to tackle these problems and there are inefficient measures to curb RTAs and reduce its attendant morbidity and mortality.(37) According to the World Health Organization, LMICs make up for 92% of mortalities due to RTAs but only 53% of documented vehicles are in these countries as at 2011.(38) Morbidity and mortality due to RTA has continued to increase in Nigeria, and account for the huge proportion of deaths in the African region.(38) 'According to a study, mortality from RTA worsened from 38.2% to 60.2% from 1991-2001'.(37) According to available data, individuals are less safe from RTA in Lagos and Nigeria as a whole is described a s a high risk zone with cause-specific mortality due to RTA of 32 per 1,000 people.(37) This can be attributed to poor infrastructures like roads, traffic signs and lights, road designs, lack of enforcement with attendant corruption of the agencies, growth in population and increase in number of vehicles including cars, motorcycles and tricycles.(38) A study in South-south Nigeria found that the tri-cyclist commonly consume large portions of both approved and unapproved drugs, indulge in excessive alcoholism, smoke lots of cannabis, inhale cocaine and take heroin in different forms.(39) The tri-cyclist opined that the drugs assist to alleviate stress, due to the occupation as well improve physical fitness there by eliminating tiredness and fagging-out. They expressed understanding on the negative effects of drug abuse on their jobs which includes vision impairment, reduced reflexes and poor reactivity to emergency, poor thought process when driving and inability to coordinate when on steering and the increase tendency for RTA to occur. (39)

Between 1970 and 2001, Mortalities and morbidities from 726,383 RTAs in Nigeria was 208,665 and 596,425 respectively. This numbers are staggering.(37)'A study in a South-western city of Nigerian on the incidence and pattern of injury among Motorcycle drivers showed that 45.3% had been involved in RTA with 62.5% and 37.5% single and multiple accidents respectively.(40) 'Age (20-29 years; 30-39 years), alcohol use and visual impairment were associated risk factors'. (40) Mortalities, disabilities, and morbidities from road accidents predominantly affect the younger and the economically productive ages.(38) RTC among Motorcyclist caused about for 54% of all RTI in Nigeria.(41) 'The riders commenced driving without any formal training or pedigree in driving.(41) 'Riders believe it was not mandatory and not enforced to have a formal training or obtain a license prior to being a motorcyclist'.(41) 'A study by Odivwri to identify the rate of substance abuse by 'Keke' Riders in a northern state found myriads of reasons for indulging in substance abuse include improvement in sexual performance, relive anxious moments, and enhance physical work rate and induced courage.(42) The study also showed that tri-cyclist develop poor health, become less productive with attendant increase in RTA on major roads especially the trunk A roads.(42) 'There is significant relationship between age and substance abuse'.(42) A study in Jos, Nigeria 'to identify the pattern of alcoholism and drunk driving among tri-cyclist and occurrence of RTA found that all the one hundred and ninety-five tricycle drivers studied were males and all consume alcohol'.(43) 'Most of them (67.4%) drink and drive'. 'A hundred and seventeen (60%) of respondents have had an accident in the last year and 70% of the accidents occurred due to drunk driving'.(43)'There was no association between frequency of drinking and involvement in road traffic accident'.(43) Oginyi and Mbamin a 'study to determine psycho-active substance use as a predictor of reckless driving amongst 'Keke' drivers in South-east Nigeria showed that there was relationship between psychoactive substance use and reckless driving among 'Keke' riders'.(44)

Lagos State Government enacted a bill into law in august 2012, banning the use of two-wheelers (Motorcycles) for commercial purposes on major bridges and roads, mostly trunk A roads. (45) Motorcyclist below 18 years of age were also prohibited by law.(45) 75% mortality was recorded for Motorcycles in a study done in Lagos prior to enforcement of the ban and 25% following the ban'.(45)'The study attributed the reduction to the use of helmet but could not ascertain if age restriction played a role in reducing the prevalence of mortality'. 'There is a prevalence of 46% for RTA among Tricycle drivers in a Northern City in Nigeria'. (15) In the study, 'Psychoactive substance use was significantly associated with RTA'.(15) Age was not considered a factor in this study. Also, it did not describe the pattern of the injuries and mechanism of accidents unlike the study done in Khartoum, Sudan. (2) As such, the study did not explore the numerous risk factors that could contribute to RTA in tri-wheeler drivers.

d) Rationale of the Study

The only study found to have been done in Nigeria did not consider age of the participant as an important risk factor. It is known that youths are largely affected in RTA and it worsens the DALYs. This study will

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explore the various risk factors as well as the association of age with RTA among youth tri-wheeler drivers. This will promote safety on the roads and thereby reduce incidence and prevalence of RTA.

e) Aim

To reduce the prevalence of RTA among Tri-Wheeler drivers and improve the use of Tri-wheeler for commercial transportation in Victoria Island, Lagos.

f) Objectives

General

1. To calculate the prevalence of RTA among youth Tri-wheeler drivers in Victoria Island, Lagos.

Specific

1 To identify the associated factors of RTA among youth Tri-wheeler drivers in Victoria Island, Lagos.
2. To estimate the most common type of injury in RTA among youth Tri-wheeler drivers in Victoria Island, Lagos.
3. To identify the most common type of RTA among tri-wheeler drivers in Victoria Island, Lagos.

Hypothesis

1. Age is a determinant of RTA among tri-wheeler drivers in Victoria Island Lagos.
2. Marital Status is a determinant of RTA among tri-wheeler drivers in Victoria Island Lagos.
3. Duration as a driver is a risk factor for RTA among tri-wheeler drivers in Victoria Island Lagos.
4. Use of phone while driving is a risk factor for RTA among tri-wheeler drivers in Victoria Island Lagos.
5. Traffic Violation is a risk factor for RTA among tri-wheeler drivers in Victoria Island Lagos.

III. Methodology

a) Research Design

This is a Cross-Sectional Analytical Survey that examine RTA among youth Tri-wheeler drivers so as to determine the level of safety of Tri-wheelers when compared to Motor-cycles. This is with a view to also identify the risk factors associated with RTA among Tri-wheeler drivers and recommend possible measures to mitigate these risk factors.

b) Sample Size

Using a prevalence of 68% of RTA; (5) Confidence Interval of 95%; Level of Significance of 0.05. Sample Size = 335. To cater for likely rejections, 35(10%) participants were added, (46) there were approximately 370 participants. The study population was calculated using the formula: S= (Z2 × P (1-P)) /m2, where 'S' is Sample size; 'Z' represents 95% confidence level, and is valued at 1.96, 'p' = 0.68 based on a previously reported prevalence of 68% of RTA among Motor-cycle drivers in a Southern-City of Nigeria (5), 'and 'm' representing margin of error which is valued at 0.05.

A total of 370 participants were recruited. With the exclusion criteria, the sample size reduced to 316 participants as about 54 participants were beyond the acceptable age for the study.

c) Research Subjects

The research subjects were drivers of Tri-wheeler in Victoria Island, Lagos. Participants were drivers of Tri-wheeled vehicles selected from a list that made available from their Union Heads through the Headquarters Local Government Area.

Inclusion Criteria:

- Tri-wheeler Driver as at the time of the study or in the last 12 months.
- Age range 15-34years (Youth)(18)
- More than 6months as a driver.
- Registered Member of the Tri-wheelers Association. (15)

Exclusion Criteria:

- Not a primary driver/owner of the tri-wheeler.
- Inability to communicate in 'Pidgin'/English Language.

d) Sampling Technique

Sampling method employed was Systematic Random Sampling to select the 370 participants. The participants occurring in every 3rd were selected. The total number of the members was 1115 and this number was divided by 370, hence every third participant was issued a questionnaire. The questionnaires were numbered to capture the estimated sample size. The participants were allowed to discontinue with the research at any point in time during the period but none withdraw as they were properly counselled in local language (pidgin).

e) Research Setting

This study was done within Victoria Island, Lagos, Nigeria with an estimated total participant population of 370 respondents. Victoria Island (VI) is a high-brow city located between Lagos Island and the Lekki Peninsula.(47) It is the major business and financial exchange center of Lagos, Nigeria.(47)It is located on Latitude 6o25' 31.19" N and Longitude 3o 24' 34.19" E.(47)

f) Study Instruments

Structured Pre-tested Modified Motorcycle Rider Behaviour Questionnaire (MRBQ) (48) was adapted for the drivers. It was a Nigerian version that has been reworded and necessary modifications made to adapt the questionnaire items to a Nigerian socio cultural context. (48) The Questionnaire was pre-tested with about 30 drivers (49) in a South-south city called Benin City.

The questionnaire was a 25-item questionnaire which was updated and divided into two sections.

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Section 1 contained the socio-demographic information of the driver such as age, sex, level of education, marital status, number of years as a driver (in months), and no of accidents. Section 2 identified risk factors to RTA, severity of previous injuries incurred due to RTA the part of the body involved, condition of the road, persons affected in the accident, time/period of day the accident occurred. It was forward translated into a local language (Pidgin) and back translated. (49) by translators in the Department of Community Health, University of Benin. Inter-rater reliability was used and the kappa (k) = 0.75, that is, 'Good Agreement'.(49)An expert group in Department of Community Health, University of Benin Teaching Hospital, perused the questionnaire and ensured appropriate content domain in the items thereby assessing the content validity. Finally, the five-point rating scale (l - never, 2 - occasionally, 3 - frequently and 4 - nearly all the time) was changed to a five-point rating scale (1- Always, 2- Usually, 3 – Sometimes, 4- Rarely, 5- Never) so as to make it simple for the respondents.(48)

g) Collection of Data

Primary Data: Interviewer-administered questionnaire by Three-wheeler Drivers. From the four major parks, 370participants were selected., Lagos. 30 respondents' questionnaires were directly filled by the researcher as he rode with them from one point to the other. Data was collected at the close of work as the respondents demanded.

Secondary data could not be collected as neither the FRSC, The Nigerian Police nor the Local Government Headquarter had data on road traffic accidents involving tri-wheeled vehicles in Victoria Island. This confirms the notion assumed by many that tri-wheeled vehicles are safe because they have data on motorcycle accidents but none on tri-wheeled vehicles.

h) Technique

The questionnaire was administered by an interviewer and information collected from the respondents. This information includes: biodata, level of education, formal rider's training, possession of valid driver's license, occurrence of accidents in the past 12months, type of accident, injury, traffic offences, use of psychoactive substance, number of years as a driver, number of accidents, se and other characteristics. 30 Questionnaires were filled by the researcher via direct observation on riding the Tri-wheeler.

i) Study Duration

The duration of the study was fixed as 3 months. The research was completed keeping in view the given time frame.

j) Variables

i. *Independent Variables*

- Age
- Sex
- Marital Status
- Level of Educational
- Certification: Possession of Licence.
- Psychoactive Substance Use: Alcohol, Marijuana, Fuel, Gum, Heroine.
- Environmental Effects: Bad Roads, weather conditions, narrow roads.
- Traffic Laws: Over-speeding, Unnecessary over-taking, Over-loading, No brakes.
- Number of years as a driver (in months): 1-≤6months: >6-≤12months: >12-≤18months:>18-≤24months; >24months.
- Use of Mobile Phone while Driving.

ii. *Dependent Variables*

- Number of Accidents: 1;2;3;4;5
- Type of accident: Head-on collision; Side-hitting; Toppling; Hit-from-behind.
- Type of injury: Soft tissue injury; Head injury; Single fracture; Multiple injuries, Death.(50)
- Time accident occurred: Morning(12am-6am); Day(>6am-12pm); Afternoon(>12pm-6pm); Night (>6pm-12am)
- Person Affected: Driver; Passenger.

k) Data Analysis

The data collected on the questionnaires were extracted and stored using the SPSS software, Version 22. Data was presented in descriptive statistical tools like frequency tables, bar and pie charts.

Regression Model was used in analyzing the data to determine association between the variables like Marital Status and RTA. The level of significance is 0.05 and Confidence Interval of 95%. Data were analyzed for total of 316 participants which is 85.41% of the collected data samples.

l) Ethical Issues

Approval was given by the Internal Review Board, Health Services Academy. Participation was voluntary. The National Commercial Tricycle and Motorcycle Owners and Riders Association (NACTOMORAS) office in Victoria Island, Lagos gave approval for the enlistment of her members in the study.(15)Written Informed Consent(51) was issued in the participant's local language (Pidgin) and signed by the participant as approval and acceptance to be part of the research. The information volunteered by the participant was not shared with any third party. The Informed Consent Form is attached as Annex A. No physical or psychological harm was caused to the any of the participants.

m) Significance of the Study

1. It contributes to the body of knowledge as the prevalence is known.

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2. It raises awareness on the RTA among Three-wheeler drivers as it seems neglected.
3. It raises awareness on the need to screen drivers especially young adults.
4. It can influence the adoption of tri-wheelers as a means of commercial transport in other communities and cities.

IV. Results

a) Descriptive Statistics

The findings of the analysis done using SPSS version 22 are as shown below the various tables and figures listed.

i. *Prevalence of RTA among Young Tri-wheeler Drivers*

The prevalence of road traffic accident among the drivers is 51.6%. This shows that more than half of the respondents have had RTA. This can put in another form that in every two drivers, one had RTA. (table 1)

Table 1: Prevalence of RTA among Young Tri-Wheeler Drivers

		Frequency	Percent
HAVE YOU EVER HAD A ROAD TRAFFIC ACCIDENT	No	153	48.4
	Yes	163	51.6
	Total	316	100.0

ii. *Age of Participants*

Table 2 shows that 46% (146) of the respondents were between the age of 15-24 years while 53.8% (170) were between the ages of 25-34years.

Table 2: Age of Participants

		Frequency	Percent
	15-24	146	46.2
	25-34	170	53.8
	Total	316	100.0

iii. *Level of Education of Young Adult Drivers*

Figure 1 is a pie chart which shows the level of education of the drivers. Majority of them had primary (24%) and secondary (62%) education. Only a few had no formal education (5%) while a handful had tertiary education (9%). The drivers are seen as unskilled hence many graduates do not take up driving 'Keke' as a full-time job.

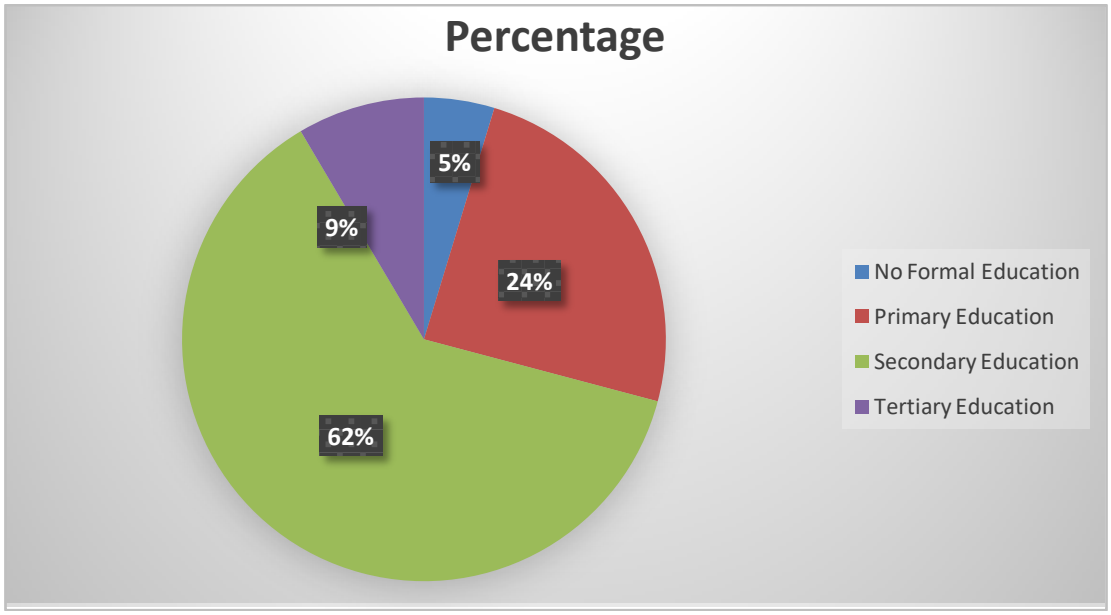


Figure 1: Level of Education of Young Adult Drivers

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iv. *Marital Status of Young Adult Drivers*

The table below (table 3) demonstrates the result of the marital status of the drivers. Majority of whom are single, that is never married (68.35%), some were married (31.33%) while very few were divorced/separated (0.316%). Most of the drivers are single as this study focused on the young drivers.

Table 3: Marital Status of Young Adult Drivers

		Frequency	Percent
	Single	216	68.4
	Married	99	31.3
	Separated/Divorced	1	.3
	Total	316	100.0

v. *Type of Injury in RTA among Young Adult Drivers*

Soft Tissue injuries were the most common (64.82%), followed by head injury (29.63%), single fracture (3.70%) and multiple injuries (1.85%). (figure 2).

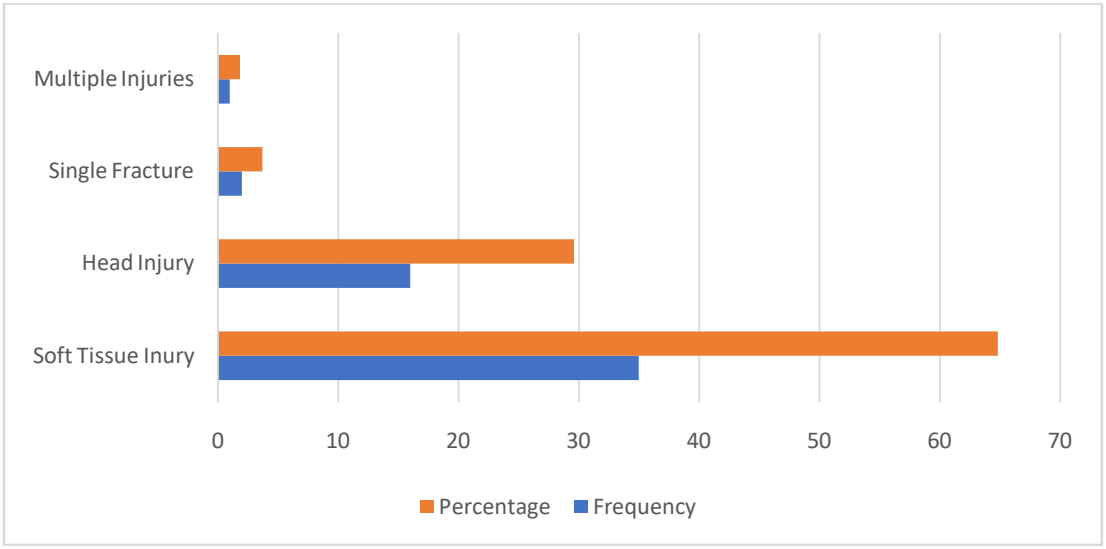


Figure 2: Type of Injury in RTA among Young Afult Drivers

vi. *Who was affected in the RTA*

Majority of the accidents, 109 respondents, did not affect any individual (66.87%), the driver was affected in 40 (24.54%) accidents while 6 and 8 passengers at the front (3.68%) and back (4.91%) respectively were evenly affected. (figure 3)

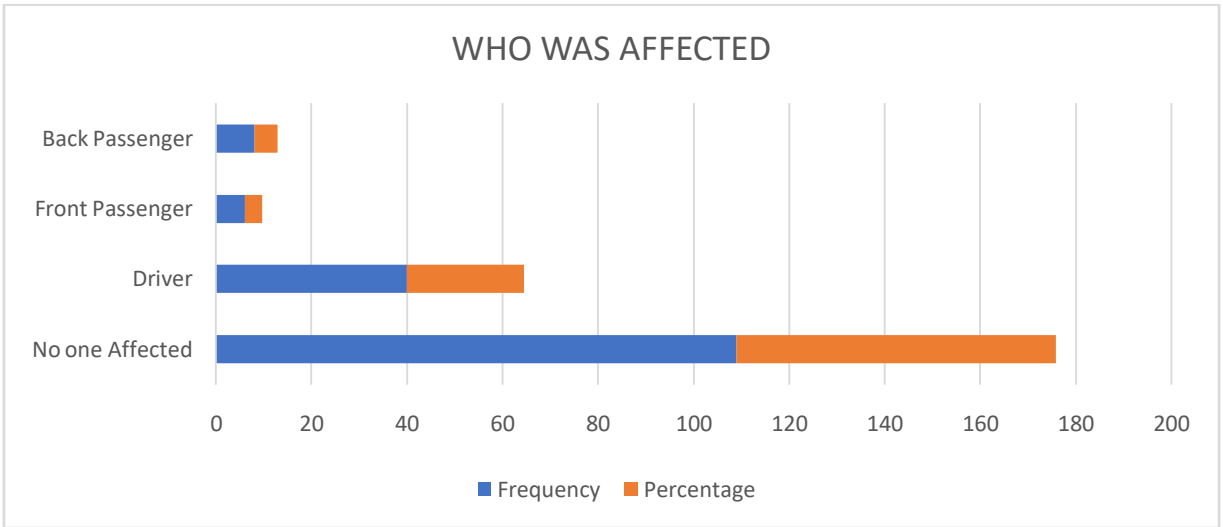


Figure 3: Who was affected

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vii. *Mobile Phone use While Driving*

Figure 4 shows the use of phone by drivers while riding. 149 respondents said agreed to have 'never' driven while on the phone (47.2%), 80 respondents (25.3%), agreed they 'rarely' do so. 67 respondents (21.2%) 'sometimes' do so while 20 respondents (6.3%) accepted that they 'always' use mobile phone.

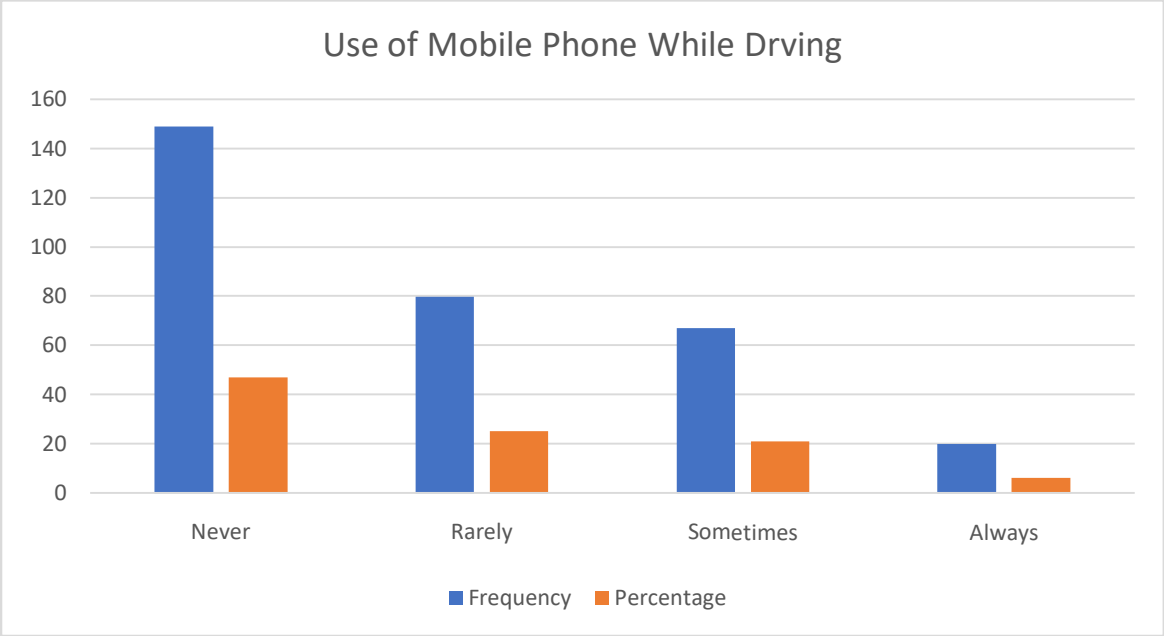


Figure 4: Mobile Phone Use While Driving

viii. *Traffic Violation*

Table 4 shows response to traffic violations and 223 respondents (71%) agreed to have violated traffic regulations in one way or the other.

Table 4: Traffic Violation

Response	Frequency	Percentage
Yes	223	70.6
No	93	29.4
Total	316	100

ix. *Type of Traffic Violation*

Types of traffic offences committed by these drivers. 126 respondents (56.50%) had wrong parking, 51 (22.87%) respondents had wrong turn, 23 respondents (10.31%) had red-light violation, 21 respondents (9.42%) had over-loading and 2 (0.90%) were involved in over-speeding. (Figure 5)

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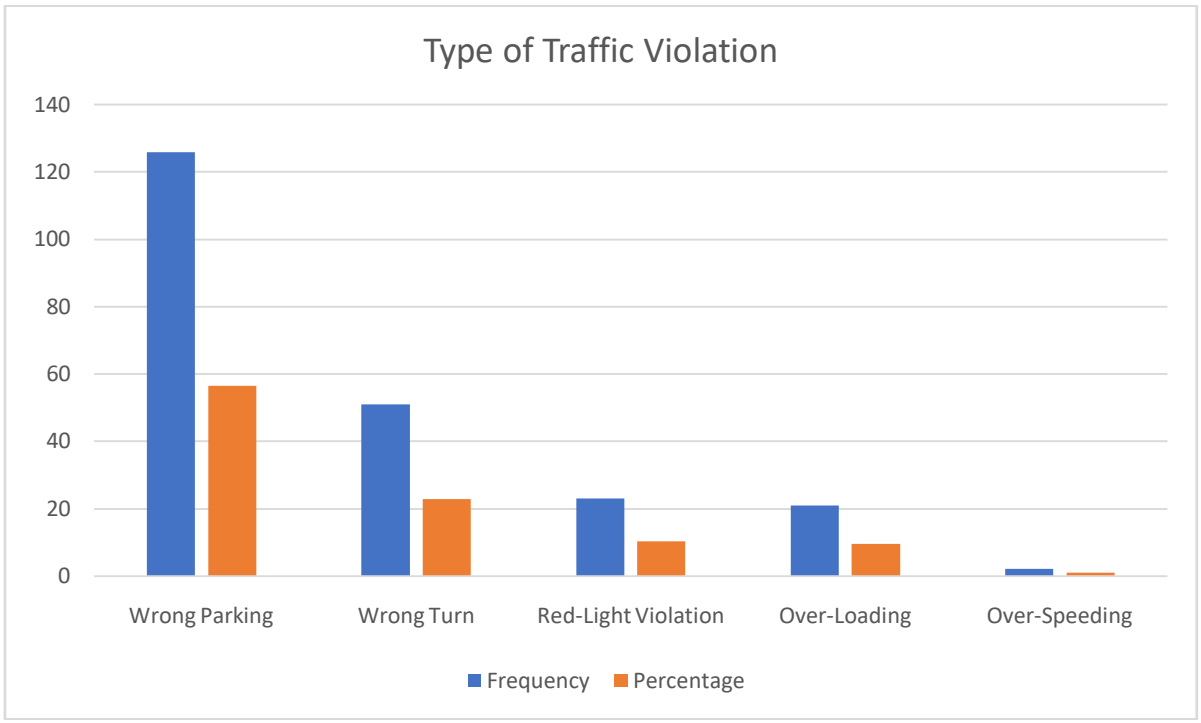


Figure 5: Type of Traffic Violation

x. *Duration as a Driver*

19 respondents (6%) have been drivers for less than 1year, 75 respondents (23.7%) have been drivers for 1-2years, 84 (26.6%) have been drivers for 2-3years, 62 (19.6%) had been drivers for 3-4years, 45 (14.2%) had been drivers for 4-5years and 31 (9.8%) had been drivers for 5years and above. (Figure 6)

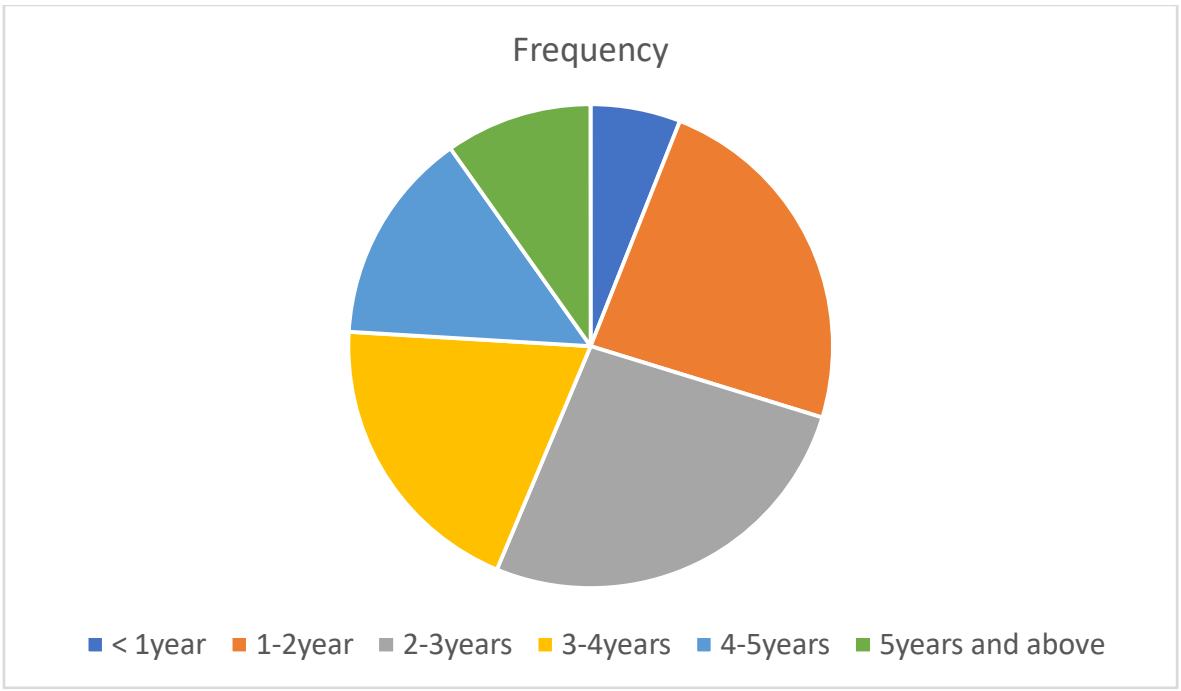


Figure 6: Duration as Driver

xi. *Type of Accident*

Table 5 shows that the most common RTA among the drivers is side-hit with 51.53% followed by front-hit with 15.34%.

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Table 5: Type of Accident

		Frequency	Percent
WHAT TYPE OF ACCIDENT	No Response	31	19.02
	Side Hit	84	51.53
	Head On collision	1	0.60
	Front Hit	25	15.34
	Topple over	9	5.52
	Hit immobile object	12	7.36
	head-on-collision	1	0.60
	Total	163	100.0

xii. *Possession of Licence and Number of Months of FRT*

272 respondents who had licences had no formal training while only 11 had formal rider's training and license. 31 respondents had no formal training and no license while 13 had formal training but no license. This shows poor supervision and monitoring by the regulatory agencies.

Table 6: Possession of Licence and Months of FRT

Variable	Number of months of FRT	
	No Formal Training	1-3 months of Training
Do you have license? Yes	272	11
No	31	13

b) Inferential Statistics

i. *Age and RTA*

Table 7 shows there is no association between driver's age and the occurrence of RTA because the computed p-value is 0.61 hence we fail to reject the null hypothesis.

Table 7: Age and RTA

Variables	RTA			
	R Square	Y^2	df	p-value
Age	.011	.879	1	.061

ii. *Marital Status and RTA*

Table 8 shows there is association between marital status and occurrence of RTA as the computed p-value is 0.009 which is lower than p-value of 0.05, hence we reject the null hypothesis. Marital status is a risk factor for RTA among tri-wheeler drivers.

Table 8: Marital Status and RTA

Variables	RTA			
	R Square	Y^2	df	p-value
Marital Status	.021	1.681	1	.009

iii. *RTA and Duration as a Driver*

Table 9 shows there is association between RTA and duration as driver as the computed p-value is .002 lower than p-value of 0.05. Duration as a driver is a risk factor for RTA.

Table 9: RTA and Duration as a Driver

Variables	RTA			
	R Square	Y^2	df	p-value
Duration as a Driver	.030	2.330	1	.002

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iv. *RTA and Use of Mobile Phone*

Table 10 shows that driving while using the phone is a risk factor for RTA as the computed p-value is .000 hence we reject the null hypothesis.

Table 10: RTA and Use of Mobile Phone while Driving

Variables	RTA			
	R Square	Y^2	df	p-value
Use of Mobile Phone	.049	3.902	1	.000

v. *Type of injury and Type of accident*

There is a correlation between the kind of injury sustained and the mechanism of RTA as the computed p-value is 0.003, hence we reject the null hypothesis, the type of accident maybe a determining factor for the kind of injury.

Table 11: Type of Injury and Type of Accident

Variables	Kind of Injury			
	R Square	Y^2	df	p-value
Type of Accident	.185	3.984	1	.003

vi. *Level of Education and RTA*

Table 12 shows that level of education affects the occurrence of RTA as the computed p-value is 0.04, hence we reject the null hypothesis.

Table 12: RTA and Level of Education

Variables	RTA			
	R Square	Y^2	df	p-value
Level of Education	.013	1.047	1	.041

vii. *Level of Education and Type of Accident*

Table 13 shows there is no correlations between attainment of education and RTA. The level of education does not determine the kind of accident.

Table 13: Level of Education and Type of Accident

Variables	Type of Accident			
	R Square	Y^2	df	p-value
Level of Education	.010	2.417	1	.267

viii. *Traffic Violation and RTA*

Table 14 shows that Traffic violation is a risk factor for RTA among motorcycle drivers. The computed p-value was .000.

Table 14: RTA and Traffic Violation

Variables	RTA			
	R Square	Y^2	df	p-value
Traffic Violation	.111	2.417	1	.000

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ix. *Formal Rider's Training and RTA*

Table 15 shows there is no correlation between Formal rider's training and RTA as the computed p-value is .465.

Table 15: RTA and Formal Rider's Training

Variables	RTA			
	R Square	Y^2	df	p-value
Formal Rider's Training	.002	.134	1	.465

x. *Valid driver's License and RTA*

The table below shows no correlation between possession of valid licence and RTA.

Table 16: RTA and Valid Driver's Licence

Variables	RTA			
	R Square	Y^2	df	p-value
Valid Driver's License	.011	.863	1	.063

V. Discussion

This research was conducted to estimate the prevalence of RTA and its determinants among tri-wheeler drivers in a city of Victoria Island in the South-western State of Lagos, Nigeria. Victoria Island (VI) is an affluent town that encompasses a former island of the same name that sits between Lagos Island and the Lekki Peninsula in the Lagos Lagoon.(47) It is the main business and financial center of Lagos, Nigeria.(47) It is located on Latitude 6o 25' 31.19" N and Longitude 3o 24' 34.19" E.(47). With ban of Motorcycles (3), use of commercial tricycles has been of the rise and has been associated with accidents as the study discovered.

The prevalence of RTA in this study was 51.6%. A similar study on tricycles done in the North-eastern part of Nigeria had a prevalence of 46%.(15) A study done in Khartoum had a prevalence of 28.8%(2). A study by Ofonime and Effiong to estimate RTA among Motorcycle drivers in Uyo, Nigeria showed a prevalence of 68%.(5) A study by Morenike and Umaru in North-Central part of Nigeria on Motorcyclist found RTA prevalence of 54.2%.(52). The prevalence of RTA among Motorcycle drivers in these quoted studies are higher when compared to that of tri-wheelers. That could mean that tri-wheelers maybe safer than Motorcycles, although more studies need to be done to determine this hypothesis.

Forty-six percent (146) was of age range of 15-24 years while 53.8% (170) were between the ages of 25-34years. The study focused on the younger age group. Majority had education up to secondary level (62%) while a handful had primary level education (24%). Only a few had no formal education (4.7%) while a small percentage had tertiary education (8.5%). The drivers are seen as unskilled hence many graduates do not take up driving 'Keke' as a full-time job. Majority of the drivers are single, that is never married (68.35%), some were married (31.33%) while very few were divorced/separated (0.316%). Most of the drivers are single as this study focused on the young drivers.

Soft Tissue Injuries were the most common (64.82%), followed by head injury (29.63%), single fracture (3.70%) and multiple injuries (1.85%). This was corroborated by the study in Khartoum which showed that majority, 146 patients (70.5%), had soft tissue injuries. (2) No mortality was recorded in this study. In a study by Emiogun and co., there were 128 motorcycle death autopsies recorded during the period of study with 96 cases (75%) before the law and 32 cases (25%) after the law.(45) The frequency of head injury was 39.8% before the law and 43.6% after the law.(45) This also buttresses the point that tri-cycle maybe safer than motorcycle.

Majority of the accidents, 109 respondents, did not affect any individual (66.87%), the driver was affected in 40 (24.54%) accidents while 6 and 8 passengers at the front (3.68%) and back (4.91%) respectively were evenly affected. A study by Alkabli in Khartoum found that the most affected group were passengers, 109 patients (52.7%)(2), drivers were 59 patients (28.5%) and pedestrians 39 patients (18.8%).(2) A total of 149 respondents said they 'never' drove while on the phone (47.2%), 80 respondents (25.3%), agreed they 'rarely' do so. 67 respondents (21.2%) 'sometimes' do so while 20 respondents (6.3%) accepted that they 'always' use mobile phone. Figure 5 shows response to traffic violations and 223 respondents (71%) agreed to have violated traffic regulations in one way or the other. Types of traffic offences committed by these drivers. 126 respondents (56.50%) had wrong parking, 51 (22.87%) respondents had wrong turn, 23 respondents (10.31%) had red-light violation, 21 respondents (9.42%)

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had over-loading and 2 (0.90%) were involved in over-speeding.

About 19 respondents (6%) have been drivers for less than 1year, 75 respondents (23.7%) have been drivers for 1-2years, 84 (26.6%) have been drivers for 2-3years, 62 (19.6%) had been drivers for 3-4years, 45 (14.2%) had been drivers for 4-5years and 31 (9.8%) had been drivers for 5years and above. The most common RTA among the drivers is side-hit with 51.53% followed by front-hit with 15.34%. A study done in Khartoum showed that the commonest form of RTA was toppling of the tri-wheeler. (2) topple over was found to be 5.52% in this study. 272 respondents who had licences had no formal training while only 11 had formal rider's training and license. 31 respondents had no formal training and no license while 13 had formal training but no license. This shows poor supervision and monitoring by the regulatory agencies.

The study showed no association between driver's age and RTA because the computed p-value is 0.61 hence we fail to reject the null hypothesis. A study by Asuzu AL and co, showed that fatal injuries are commoner in younger drivers (<30 years of age) compared to older motorcyclist(30years or >30 years of age)(53)This survey shows that marital status is a determinant of RTA as the computed p-value is 0.009 which is lower than p-value of 0.05. Marital status is a risk factor/determinant for RTA among tri-wheeler drivers. It contributes about 2%.There is association between RTA and duration as driver as the computed p-value is .002 lower than p-value of 0.05. Duration as a driver may be a risk factor/determinant for RTA. About 3% of the accident that occurred can be attributed to duration as a driver.

Driving while on the phone is a risk factor for RTA as the computed p-value is .000 hence we reject the null hypothesis. 5% of the accident can be attributed to this risk factor. In a similar study by Balami and Gambo, they found that use of phone while driving was not associated with RTA.(15) A study by Audu et al in Benue, North-central Nigeria found majority (72.5 %) of the respondents who had experienced auto crash, had it driving while on the phone. The association was established in the study.(54)A study by Khan and Tehreem in Pakistan found that driving while on the phone was one of the causes of RTA.(55)

There is association between the kind of injury sustained and the type of accident that occurred as the computed p-value is 0.003, which is lower than the p-value of 0.05. The type of accident maybe a determining factor for the kind of injury. 20% of the kind of injury can be attributed to type of accident. Level of education affects the occurrence of RTA as the computed p-value is 0.04. Only 1% of the accident can be determined by the level of education. There is no correlations between level of educational attainment and mechanism of RTA. The level of education may not be a determinant of the kind of accident.

Traffic violation is a risk factor for RTA among tri-wheeler drivers. The computed p-value was .000. 11% of accident can be attributed to traffic violations. 'A study Achala .U.J and co, in Sri-Lanka found that traffic offences in the past 12 months contributed to RTA.'(26)'A study in China to determine factor and injury severity established that (56) enhanced control of traffic offences led to reduced rate of serious morbidities and mortalities. (56)

There is no correlation between Formal Rider's Training and RTA as the computed p-value is .465. This study also discovered that there is no correlation between possession of valid licence and RTA. A Meta analysis by Jose I.C-M. And Mercedes C-Non possession of valid driver's licences showed 'Improvement in behavior with an average reduction of 30% in traffic offences, an average reduction of over 50% in cold and emergency cases admissions and reductions of 15-20% in morbidities and mortalities. (57)

VI. Conclusion

Tri-wheelers have become a major mode of transport in Nigeria as the study has discovered.(3) Albeit its relative safety (prevalence of RTA 46%(15) and 51.6% (Figure 4) from tri-wheeler against 68%(5) and 54% (52) for motorcycle), it is accident-prone as a vehicle. However, no death was recorded in this research as against the 75% (45) mortality found in a study for Motorcycles.

The predictors of RTA discovered in the study include driving while on the phone, marital status, duration as a driver and traffic violation because they had computed p-values of 0.000, 0.009,0.002 and 0.000 respectively. Education of the drivers on these key determinants will go a long way in ensuring and improving safety of the tri-wheelers as most commercial cities in Nigeria ban Motorcycles to adopt tri-wheelers as a means of transport.

VII. Limitations of the Survey

1. The lack of secondary data from the FRSC, the |Nigerian Police Force and the Headquarter of Iru/Victoria Island LGA made impossible to ascertain the proportion of RTA due to tri-wheelers.
2. The proportion not being determined affected the possible comparison between tri-wheelers and motorcycles to determine which is safer as a means of intra-city transportation.
3. The drivers were only willing to cooperate after the day's job as they are very concerned with the time spent in answering questions and filling the questionnaire. This made it difficult for the interviewers as they had to wait on the drivers most times, hence this prolonged the data collection

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beyond the allotted duration of 4weeks to about 6weeks.

4. All the respondents were males; hence no comparison could be made on the basis of gender or sex.
5. All respondents denied substance abuse even though anecdotal evidence points to the contrary.

VIII. Recommendations

1. Paucity of data should be addressed to enhance the quality of researches in this field. Records of accidents should be documented by the relevant agencies to enhance planning and policy-making.
2. Tri-wheeler can be introduced in most cities and motorcycles phased out over time so as to improve safety and eliminate mortality due to motorcycles thereby improving lives.
3. Tri-wheeler drivers should be properly trained prior to induction as drivers so as to reduce the prevalence of RTA.
4. The four determinants of RTA among tri-wheeler drivers should be printed in fliers and circulated among them to educate them of how to avoid the pitfalls.

IX. Recommendations for Further Studies

1. Severity of the injuries due to RTA by tri-wheelers need to be studied so as to determine the impact on the economy.
2. Research on the information available to tri-wheeler drivers on traffic codes and rules need to be determined to enhance safety.
3. The contribution of the status and functionalities of the tri-wheeled vehicles to RTA need to be determined so as to enhance productivity and reduce the hazards on the roads.

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Global Journal of Medical Research: K
Interdisciplinary
Volume 20 Issue 5 Version 1.0 Year 2020
Type: Double Blind Peer Reviewed International Research Journal
Publisher: Global Journals
Online ISSN: 2249-4618 & Print ISSN: 0975-5888

Results of Hygiene Education of Kitchen Stove Knob and Water Faucet by using ATP Inspection

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Abstract- In Japan, many food poisoning cases occur every year form the rainy season to summer. After all, restaurants account for about 50% of all food poisoning cases. Still they also occur at school meals (6.4%) and hospitals (0.6%), where hygiene management should strictly controlled in the Ministry of Health, Labor, and Welfare announced (2019). Therefore, from the viewpoint of food poisoning prevention, this study focused on the stove knob and water faucet, which are often touched by the cook's fingers in the kitchen and may cause secondary contamination. The effect of hygiene education investigated by measuring invisible microbial load as visible ATP value using ATP wiping test. The 12 stove knob and 11 water faucet inspected before and after hygiene education by using the ATP wiping test. Before hygiene education, the average value of the ATP values measured after washing before and after washing. To the surprise, after washing, the ATP value did not drop below 1000 for Stove knob and Water faucet. Almost the same ATP value as before cleaning.

Keywords: *gender; ATP wiping test, stove knob, water faucet, Hygiene education, double wash.*

GJMR-K Classification: *NLMC Code: QT 180*



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Results of Hygiene Education of Kitchen Stove Knob and Water Faucet by using ATP Inspection

Naomi Katayama [α], Shoko Kondo [σ], Akemi Ito [ρ], Mayumi Hirabayashi [ω], Yui Nakayama [¥], Ayari Naka [§], Natuki Sasaki [χ], Moe Inuzuka [ν] & Takashi Tamura [Θ]

Abstract- In Japan, many food poisoning cases occur every year form the rainy season to summer. After all, restaurants account for about 50% of all food poisoning cases. Still they also occur at school meals (6.4%) and hospitals (0.6%), where hygiene management should strictly controlled in the Ministry of Health, Labor, and Welfare announced (2019). Therefore, from the viewpoint of food poisoning prevention, this study focused on the stove knob and water faucet, which are often touched by the cook's fingers in the kitchen and may cause secondary contamination. The effect of hygiene education investigated by measuring invisible microbial load as visible ATP value using ATP wiping test. The 12 stove knob and 11 water faucet inspected before and after hygiene education by using the ATP wiping test. Before hygiene education, the average value of the ATP values measured after washing before and after washing. To the surprise, after washing, the ATP value did not drop below 1000 for Stove knob and Water faucet. Almost the same ATP value as before cleaning. It turned out that the number of microorganisms did not decrease even if the cooks cleaned themselves. Then, the inspector wash the stove knob and water faucet firmly with detergent and sponge, wipe clean with a clean cloth three times or more. The inspector taught the cooks to repeat this process twice. The cook tries to do it as same as the inspector is doing. Then, the cook tries to do it next cooking. After hygiene education, the average value of the ATP values was significant low. Unfortunately, after washing, the ATP value did not drop below 100 for the Stove knob and Water faucet. Even after the hygiene education, the ATP value did not fall below 100, an indication that more rigorous hygiene education is necessary.

Keywords: gender; ATP wiping test, stove knob, water faucet, Hygiene education, double wash.

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I. Introduction

Outbreaks of food poisoning often involve cooking and providing food together, for example, school lunches, employee cafeterias, and inns with meals. Therefore, to the Japanese Ministry of Health, Labor, and Welfare, it is necessary to strictly management of hygiene. HACCP (Hazard Analysis Critical Control Point) is a base method of the hygiene management. NASA used this system to prevent Hazards related to food handling in advance. This HACCP has 12 items, and the 9th measurement method (monitoring) setting[1]. Currently, the ATP wipe test used to control microorganisms in hospitals and food companies[2,3,4]. Food poisoning in elderly facilities is likely to cause death; this is a reason why hygiene education for the staff is essential[5]. Since microorganisms are invisible, it is possible to count the number of bacteria as the number of ATP by using the ATP wiping test. This test is very useful for health education. The cook's fingers touch many places in the kitchen. And, depending on the place, there are places where the fingers of multiple cooks touched many times. For example the place, a stove knob or a water faucet. Therefore, it is necessary to repeat the hygiene education of the cooks and give a careful explanation about the places where the cook's fingers touch. The purpose of this study, the effect of hygiene education for cooks by conducting an ATP wiping test on the stove knob and water faucet installed in the kitchen.

II. Materials and Methods

a) Stove knob and Water faucet

The 12 stoves knob and 11 water faucet, prepared in the kitchen were wiped clean before the start of cooking. The stove knob ignites as it releases gas when pressed. So, every time the stove lit, the cook's finger will touch the stove knob. Similarly, the water faucet is the place where the cook's finger touches each time to uses water. Five cooktops have two stove knob and two water faucet, and one cooktop has two stove knob and one water faucet.

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b) ATP inspection procedure

Twelve cooks worked in groups of two to cook on six cooktops. Before the education of hygiene, the work start time depends on the working conditions of the cooks, but the inspector always performed an ATP inspection before using the 12 stove knob and 11 water faucet. Then, each cook finished the work, washed the 12 stove knob and 11 water faucet by himself, and they inspected the ATP inspection by inspector again. The value of ATP recorded. In the same way, after the education of hygiene, the work start time depends on the working conditions of the cooks. Still the inspector always performed an ATP inspection before using the 12 stove knob and 11 water faucet. Then, each cook finished the work, washed the 12 stove knob and 11 water faucet by himself, and they inspected the ATP inspection by inspector again. The value of ATP recorded.

III. Hygiene Education Procedure

a) Cleaning instruction

While showing the ATP result before the hygiene education to the cook, ATP inspector the stove knob and the water faucet firmly with detergent and sponge, wipe clean with a clean cloth three times or more. Then, the inspector washes again the stove knob and water faucet carefully with detergent and sponge, wipe clean with a clean cloth three times or more. The cook tries to do it as same as the inspector is doing. Then, the cook tries to do it next cooking. After the educational, results of ATP recorded.

b) Statistical processing

The results obtained compared using statistical methods. The data to be compared was subjected to an F test to determine whether to use a parametric test or nonparametric test. When there is no difference in the F test, the presence or absence of a significant difference was confirmed using the student-t-test with or without a correspondence. If there was a difference in the F test, the presence or absence of a significant difference was confirmed using the Wilcoxon test with a pair or the Mann-Whitney test without correlation.

IV. Results

a) Before hygiene education: Stove knob and Water faucet

The results of ATP wiping tests on the stove knob and the water faucet before hygiene education shown in Table 1 and Table 2. It can see that the average value of the ATP values measured after washing before and after washing and washing little bit lowers the ATP value. To the surprise, after cleaning, the ATP value did not drop below 1000 for Stove knob and Water faucet. Almost the same ATP value as before cleaning.

Table 1: ATP test result of the stove knob before cleaning instruction

	before cleaning instruction	
Place	before	after
stove 1	2730	285
stove 2	1178	356
stove 3	21	409
stove 4	1593	432
stove 5	6279	478
stove 6	1254	493
stove 7	388	906
stove 8	634	1013
stove 9	496	1131
stove 1 0	1672	1644
stove 1 1	8837	3677
stove 1 2	774	4204
Average	2154.67	1252.33
Standard deviation	2679.07	1322.4
Median	1216	699.5
Maximum	8837	4204
Minimum	21	285

Table 2: ATP test result of water faucet before cleaning instruction

	before cleaning instruction	
Place	before	after
water supply 1	574	428
water supply 2	8848	531
water supply 3	877	554
water supply 4	6122	709
water supply 5	2495	1639
water supply 6	1850	3758
water supply 7	54	4227
water supply 8	2795	4442
water supply 9	908	4922
water supply 1 0	5499	6306
water supply 1 1	28180	19893
Average	5291.09	4309.91
Standard deviation	8071.87	5577.43
Median	2495	3758
Maximum	28180	19893
Minimum	54	428

b) After hygiene education: Stove knob and Water faucet

The results of ATP wiping tests on the stove knob and the water faucet after hygiene education shown in Table 3 and Table 4. It can see that the average value of the ATP values measured after washing before and after washing and the ATP value significantly low. Unfortunately, after washing, the ATP value did not drop below 100 for the Stove knob and Water faucet.

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Table 3: ATP test result of the stove knob after cleaning instruction

	after cleaning instruction	
Place	before	after
stove 1	102	25
stove 2	137	26
stove 3	344	31
stove 4	630	32
stove 5	902	36
stove 6	5643	59
stove 7	2157	139
stove 8	293	167
stove 9	39	172
stove 1 0	949	203
stove 1 1	448	232
stove 1 2	875	245
Average	1043.25	113.917
Standard deviation	1559.37	87.4855
Median	539	99
Maximum	5643	245
Minimum	39	25

Table 4: ATP test result of water faucet after cleaning instruction

	after cleaning instruction	
Place	before	after
water supply 1	153	1
water supply 2	187	9
water supply 3	1596	15
water supply 4	91	15
water supply 5	619	25
water supply 6	183	110
water supply 7	116	114
water supply 8	3802	126
water supply 9	54131	200
water supply 1 0	712	315
water supply 1 1	794	338
Average	5671.27	115.273
Standard deviation	16109	122.242
Median	619	110
Maximum	54131	338
Minimum	91	1

c) *Statistical processing results*

i. *Comparison of ATP test values of Stove knob and Water faucet: before and after education*

Before and after hygiene education, the results of the ATP wiping test on the stove knob and the water faucet statistically compared. The results shown in Tables 5 and 6. The ATP wiping test values after hygiene education for the stove knobs and the water faucet were statistically significant difference. Although there was a statistically significant difference even before hygiene education, the ATP wiping test values for both were not less than 100, so it can say that hygiene is still insufficient.

Table 5: Statistical comparison results : ATP test results of stove knob before andafter cleaning instruction

	before cleaning instrucion		after cleaning instruction	
	before cooking	after cooking	before cooking	after cooking
Average	2154.7	1252.3	1043.3	113.9
Standard deviation	2679.1	1322.4	1559.4	87.5
F test	p = 0.011*		p=0.0001**	
Student-t test				
Wilcoxon test	p=0.239		p=0.006**	

* P<0.05, ** P<0.01

Table 6: Statistical comparison results : ATP test results of water faucet before and after cleaning instruction

	before cleaning instrucion		after cleaning instruction	
	before cooking	after cooking	before cooking	after cooking
Average	5291.1	4309.9	5671.3	115.3
Standard deviation	8071.9	5577.4	16109.0	122.2
F test	p = 0.118		p=0.0001**	
Student-t test	p=0.481			
Wilcoxon test			p=0.003**	

* P<0.05, ** P<0.01

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V. Discussion

The ATP test is a quick test because it can show the number of microorganisms by the ATP amount within one minute[6,7]. Many hospitals have adopted this method to help maintain a hygienic environment[8]. In this study, the ATP wiping test used to inspect the stove knob and water faucet in the kitchen. The ATP wiping test used to show the number of microorganisms to the cooks, and the hygiene education conducted. The ATP value after washing the stove knob and water faucet before hygiene education showed almost the same ATP value as before cooking. The ATP value did not drop below 1000 for Stove knob and Water faucet. It is not change as ATP value as before cleaning. The microorganisms could not be removed by the cook's washing. However, after the hygiene education by the demonstration of the washing method by the inspector, hygienic cleaning with a statistically significant difference was achieved. Although there was a statistically significant difference even before hygiene education, the ATP wiping test values for both were not less than 100, so it can say that hygiene is still insufficient. It found that cooks need to regularly clean stove knobs and water faucet that is touched by multiple cooks even during cooking, and wipe with a clean cloth three or more times.

Although it has said that food poisoning is unlikely to occur during the cold season, Japan's Ministry of Health, Labor, and Welfare had revealed that noroviruses often occur in winter. Also, according to the announcement from the National Institute of Infectious, there are food poisoning s caused by dysentery, cholera, typhoid, salmonella, and pathogenic Escherichia coli as import infectious diseases brought in from overseas. Food poisoning occurs when various factors such as foodstuffs, cooking utensils, fingers of cooks, and temperature and humidity of food storage overlap. To prevent this, such a cook needs to be highly aware of the hygiene management. Also, it is necessary to maintain hygiene management awareness by regularly measuring the ATP value using the AYP wiping test so that invisible microorganisms can see.

VI. Conclusions

To prevent food poisoning, which may cause fatal accidents in some cases, we examined ways to improve instruction of hygiene education. The effect of hygiene education investigated by measuring invisible microbial load as visible ATP value using ATP wiping test. The 12 stove knob and 11 water faucet inspected before and after hygiene education by using the ATP wiping test. Before hygiene education, the average value of the ATP values measured after washing before and after washing. To the surprise, after washing, the ATP value did not drop below 1000 for Stove knob and Water faucet. There was no statistically significant difference between the ATP values measured at the start of cooking and after washing after completion. The ATP value is almost the same as before cleaning. It turned out that the number of microorganisms did not decrease even if the cooks cleaned themselves. Then, the inspector washes the stove knob and water faucet firmly with detergent and sponge, wipe clean with a clean cloth three times or more. The inspector taught the cooks to repeat this process twice. The cook tries to do it as same as the inspector is doing. Then, the cook tries to do it next cooking. After hygiene education, the average value of the ATP values was significant lowers. Unfortunately, after washing, the ATP value did not drop below 100 for the Stove knob and Water faucet. However, the ATP value was statistically significant. Even after the hygiene education, the ATP value did not fall below 100, an indication that more rigorous hygiene education is necessary.

Acknowledgements

We would like to thank all the cooks who participated in this experiment. Also, we would like to thank the inspectors who also performed the ATP inspection.

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Verbs have to be in agreement with their subjects. In a research paper, do not start sentences with conjunctions or finish them with prepositions. When writing formally, it is advisable to never split an infinitive because someone will (wrongly) complain. Avoid clichés like a disease. Always shun irritating alliteration. Use language which is simple and straightforward. Put together a neat summary.

14. Arrangement of information: Each section of the main body should start with an opening sentence, and there should be a changeover at the end of the section. Give only valid and powerful arguments for your topic. You may also maintain your arguments with records.

15. Never start at the last minute: Always allow enough time for research work. Leaving everything to the last minute will degrade your paper and spoil your work.

16. Multitasking in research is not good: Doing several things at the same time is a bad habit in the case of research activity. Research is an area where everything has a particular time slot. Divide your research work into parts, and do a particular part in a particular time slot.

17. Never copy others' work: Never copy others' work and give it your name because if the evaluator has seen it anywhere, you will be in trouble. Take proper rest and food: No matter how many hours you spend on your research activity, if you are not taking care of your health, then all your efforts will have been in vain. For quality research, take proper rest and food.

18. Go to seminars: Attend seminars if the topic is relevant to your research area. Utilize all your resources.

19. Refresh your mind after intervals: Try to give your mind a rest by listening to soft music or sleeping in intervals. This will also improve your memory. Acquire colleagues: Always try to acquire colleagues. No matter how sharp you are, if you acquire colleagues, they can give you ideas which will be helpful to your research.

20. Think technically: Always think technically. If anything happens, search for its reasons, benefits, and demerits. Think and then print: When you go to print your paper, check that tables are not split, headings are not detached from their descriptions, and page sequence is maintained.

21. Adding unnecessary information: Do not add unnecessary information like "I have used MS Excel to draw graphs." Irrelevant and inappropriate material is superfluous. Foreign terminology and phrases are not apropos. One should never take a broad view. Analogy is like feathers on a snake. Use words properly, regardless of how others use them. Remove quotations. Puns are for kids, not grunt readers. Never oversimplify: When adding material to your research paper, never go for oversimplification; this will definitely irritate the evaluator. Be specific. Never use rhythmic redundancies. Contractions shouldn't be used in a research paper. Comparisons are as terrible as clichés. Give up ampersands, abbreviations, and so on. Remove commas that are not necessary. Parenthetical words should be between brackets or commas. Understatement is always the best way to put forward earth-shaking thoughts. Give a detailed literary review.

22. Report concluded results: Use concluded results. From raw data, filter the results, and then conclude your studies based on measurements and observations taken. An appropriate number of decimal places should be used. Parenthetical remarks are prohibited here. Proofread carefully at the final stage. At the end, give an outline to your arguments. Spot perspectives of further study of the subject. Justify your conclusion at the bottom sufficiently, which will probably include examples.

23. Upon conclusion: Once you have concluded your research, the next most important step is to present your findings. Presentation is extremely important as it is the definite medium though which your research is going to be in print for the rest of the crowd. Care should be taken to categorize your thoughts well and present them in a logical and neat manner. A good quality research paper format is essential because it serves to highlight your research paper and bring to light all necessary aspects of your research.

Informal Guidelines of Research Paper Writing

Key points to remember:

- Submit all work in its final form.
- Write your paper in the form which is presented in the guidelines using the template.
- Please note the criteria peer reviewers will use for grading the final paper.

Final points:

One purpose of organizing a research paper is to let people interpret your efforts selectively. The journal requires the following sections, submitted in the order listed, with each section starting on a new page:

The introduction: This will be compiled from reference matter and reflect the design processes or outline of basis that directed you to make a study. As you carry out the process of study, the method and process section will be constructed like that. The results segment will show related statistics in nearly sequential order and direct reviewers to similar intellectual paths throughout the data that you gathered to carry out your study.

The discussion section:

This will provide understanding of the data and projections as to the implications of the results. The use of good quality references throughout the paper will give the effort trustworthiness by representing an alertness to prior workings.

Writing a research paper is not an easy job, no matter how trouble-free the actual research or concept. Practice, excellent preparation, and controlled record-keeping are the only means to make straightforward progression.

General style:

Specific editorial column necessities for compliance of a manuscript will always take over from directions in these general guidelines.

To make a paper clear: Adhere to recommended page limits.



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Mistakes to avoid:

- Insertion of a title at the foot of a page with subsequent text on the next page.
- Separating a table, chart, or figure—confine each to a single page.
- Submitting a manuscript with pages out of sequence.
- In every section of your document, use standard writing style, including articles ("a" and "the").
- Keep paying attention to the topic of the paper.
- Use paragraphs to split each significant point (excluding the abstract).
- Align the primary line of each section.
- Present your points in sound order.
- Use present tense to report well-accepted matters.
- Use past tense to describe specific results.
- Do not use familiar wording; don't address the reviewer directly. Don't use slang or superlatives.
- Avoid use of extra pictures—include only those figures essential to presenting results.

Title page:

Choose a revealing title. It should be short and include the name(s) and address(es) of all authors. It should not have acronyms or abbreviations or exceed two printed lines.

Abstract: This summary should be two hundred words or less. It should clearly and briefly explain the key findings reported in the manuscript and must have precise statistics. It should not have acronyms or abbreviations. It should be logical in itself. Do not cite references at this point.

An abstract is a brief, distinct paragraph summary of finished work or work in development. In a minute or less, a reviewer can be taught the foundation behind the study, common approaches to the problem, relevant results, and significant conclusions or new questions.

Write your summary when your paper is completed because how can you write the summary of anything which is not yet written? Wealth of terminology is very essential in abstract. Use comprehensive sentences, and do not sacrifice readability for brevity; you can maintain it succinctly by phrasing sentences so that they provide more than a lone rationale. The author can at this moment go straight to shortening the outcome. Sum up the study with the subsequent elements in any summary. Try to limit the initial two items to no more than one line each.

Reason for writing the article—theory, overall issue, purpose.

- Fundamental goal.
- To-the-point depiction of the research.
- Consequences, including definite statistics—if the consequences are quantitative in nature, account for this; results of any numerical analysis should be reported. Significant conclusions or questions that emerge from the research.

Approach:

- Single section and succinct.
- An outline of the job done is always written in past tense.
- Concentrate on shortening results—limit background information to a verdict or two.
- Exact spelling, clarity of sentences and phrases, and appropriate reporting of quantities (proper units, important statistics) are just as significant in an abstract as they are anywhere else.

Introduction:

The introduction should "introduce" the manuscript. The reviewer should be presented with sufficient background information to be capable of comprehending and calculating the purpose of your study without having to refer to other works. The basis for the study should be offered. Give the most important references, but avoid making a comprehensive appraisal of the topic. Describe the problem visibly. If the problem is not acknowledged in a logical, reasonable way, the reviewer will give no attention to your results. Speak in common terms about techniques used to explain the problem, if needed, but do not present any particulars about the protocols here.

The following approach can create a valuable beginning:

- Explain the value (significance) of the study.
- Defend the model—why did you employ this particular system or method? What is its compensation? Remark upon its appropriateness from an abstract point of view as well as pointing out sensible reasons for using it.
- Present a justification. State your particular theory(-ies) or aim(s), and describe the logic that led you to choose them.
- Briefly explain the study's tentative purpose and how it meets the declared objectives.

Approach:

Use past tense except for when referring to recognized facts. After all, the manuscript will be submitted after the entire job is done. Sort out your thoughts; manufacture one key point for every section. If you make the four points listed above, you will need at least four paragraphs. Present surrounding information only when it is necessary to support a situation. The reviewer does not desire to read everything you know about a topic. Shape the theory specifically—do not take a broad view.

As always, give awareness to spelling, simplicity, and correctness of sentences and phrases.

Procedures (methods and materials):

This part is supposed to be the easiest to carve if you have good skills. A soundly written procedures segment allows a capable scientist to replicate your results. Present precise information about your supplies. The suppliers and clarity of reagents can be helpful bits of information. Present methods in sequential order, but linked methodologies can be grouped as a segment. Be concise when relating the protocols. Attempt to give the least amount of information that would permit another capable scientist to replicate your outcome, but be cautious that vital information is integrated. The use of subheadings is suggested and ought to be synchronized with the results section.

When a technique is used that has been well-described in another section, mention the specific item describing the way, but draw the basic principle while stating the situation. The purpose is to show all particular resources and broad procedures so that another person may use some or all of the methods in one more study or referee the scientific value of your work. It is not to be a step-by-step report of the whole thing you did, nor is a methods section a set of orders.

Materials:

Materials may be reported in part of a section or else they may be recognized along with your measures.

Methods:

- Report the method and not the particulars of each process that engaged the same methodology.
- Describe the method entirely.
- To be succinct, present methods under headings dedicated to specific dealings or groups of measures.
- Simplify—detail how procedures were completed, not how they were performed on a particular day.
- If well-known procedures were used, account for the procedure by name, possibly with a reference, and that's all.

Approach:

It is embarrassing to use vigorous voice when documenting methods without using first person, which would focus the reviewer's interest on the researcher rather than the job. As a result, when writing up the methods, most authors use third person passive voice.

Use standard style in this and every other part of the paper—avoid familiar lists, and use full sentences.

What to keep away from:

- Resources and methods are not a set of information.
- Skip all descriptive information and surroundings—save it for the argument.
- Leave out information that is immaterial to a third party.



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Results:

The principle of a results segment is to present and demonstrate your conclusion. Create this part as entirely objective details of the outcome, and save all understanding for the discussion.

The page length of this segment is set by the sum and types of data to be reported. Use statistics and tables, if suitable, to present consequences most efficiently.

You must clearly differentiate material which would usually be incorporated in a study editorial from any unprocessed data or additional appendix matter that would not be available. In fact, such matters should not be submitted at all except if requested by the instructor.

Content:

- Sum up your conclusions in text and demonstrate them, if suitable, with figures and tables.
- In the manuscript, explain each of your consequences, and point the reader to remarks that are most appropriate.
- Present a background, such as by describing the question that was addressed by creation of an exacting study.
- Explain results of control experiments and give remarks that are not accessible in a prescribed figure or table, if appropriate.
- Examine your data, then prepare the analyzed (transformed) data in the form of a figure (graph), table, or manuscript.

What to stay away from:

- Do not discuss or infer your outcome, report surrounding information, or try to explain anything.
- Do not include raw data or intermediate calculations in a research manuscript.
- Do not present similar data more than once.
- A manuscript should complement any figures or tables, not duplicate information.
- Never confuse figures with tables—there is a difference.

Approach:

As always, use past tense when you submit your results, and put the whole thing in a reasonable order.

Put figures and tables, appropriately numbered, in order at the end of the report.

If you desire, you may place your figures and tables properly within the text of your results section.

Figures and tables:

If you put figures and tables at the end of some details, make certain that they are visibly distinguished from any attached appendix materials, such as raw facts. Whatever the position, each table must be titled, numbered one after the other, and include a heading. All figures and tables must be divided from the text.

Discussion:

The discussion is expected to be the trickiest segment to write. A lot of papers submitted to the journal are discarded based on problems with the discussion. There is no rule for how long an argument should be.

Position your understanding of the outcome visibly to lead the reviewer through your conclusions, and then finish the paper with a summing up of the implications of the study. The purpose here is to offer an understanding of your results and support all of your conclusions, using facts from your research and generally accepted information, if suitable. The implication of results should be fully described.

Infer your data in the conversation in suitable depth. This means that when you clarify an observable fact, you must explain mechanisms that may account for the observation. If your results vary from your prospect, make clear why that may have happened. If your results agree, then explain the theory that the proof supported. It is never suitable to just state that the data approved the prospect, and let it drop at that. Make a decision as to whether each premise is supported or discarded or if you cannot make a conclusion with assurance. Do not just dismiss a study or part of a study as "uncertain."

Research papers are not acknowledged if the work is imperfect. Draw what conclusions you can based upon the results that you have, and take care of the study as a finished work.

- You may propose future guidelines, such as how an experiment might be personalized to accomplish a new idea.
- Give details of all of your remarks as much as possible, focusing on mechanisms.
- Make a decision as to whether the tentative design sufficiently addressed the theory and whether or not it was correctly restricted. Try to present substitute explanations if they are sensible alternatives.
- One piece of research will not counter an overall question, so maintain the large picture in mind. Where do you go next? The best studies unlock new avenues of study. What questions remain?
- Recommendations for detailed papers will offer supplementary suggestions.

Approach:

When you refer to information, differentiate data generated by your own studies from other available information. Present work done by specific persons (including you) in past tense.

Describe generally acknowledged facts and main beliefs in present tense.

The Administration Rules

Administration Rules to Be Strictly Followed before Submitting Your Research Paper to Global Journals Inc.

Please read the following rules and regulations carefully before submitting your research paper to Global Journals Inc. to avoid rejection.

Segment draft and final research paper: You have to strictly follow the template of a research paper, failing which your paper may get rejected. You are expected to write each part of the paper wholly on your own. The peer reviewers need to identify your own perspective of the concepts in your own terms. Please do not extract straight from any other source, and do not rephrase someone else's analysis. Do not allow anyone else to proofread your manuscript.

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Topics	Grades		
	A-B	**C-D**	**E-F**
Abstract	Clear and concise with appropriate content, Correct format. 200 words or below	Unclear summary and no specific data, Incorrect form Above 200 words	No specific data with ambiguous information Above 250 words
Introduction	Containing all background details with clear goal and appropriate details, flow specification, no grammar and spelling mistake, well organized sentence and paragraph, reference cited	Unclear and confusing data, appropriate format, grammar and spelling errors with unorganized matter	Out of place depth and content, hazy format
Methods and Procedures	Clear and to the point with well arranged paragraph, precision and accuracy of facts and figures, well organized subheads	Difficult to comprehend with embarrassed text, too much explanation but completed	Incorrect and unorganized structure with hazy meaning
Result	Well organized, Clear and specific, Correct units with precision, correct data, well structuring of paragraph, no grammar and spelling mistake	Complete and embarrassed text, difficult to comprehend	Irregular format with wrong facts and figures
Discussion	Well organized, meaningful specification, sound conclusion, logical and concise explanation, highly structured paragraph reference cited	Wordy, unclear conclusion, spurious	Conclusion is not cited, unorganized, difficult to comprehend
References	Complete and correct format, well organized	Beside the point, Incomplete	Wrong format and structuring

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Global Journal of Medical Research

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ISSN 9755896



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