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MOTIVATION OF RAW MILK CONSUMPTION AMONG MALAYSIANS

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Abstract: *Raw or unpasteurized milk is rich with beneficial nutrients including calcium, potassium, phosphorus and vitamins. Recently, there was a tremendous demand for raw milk in the local market. However, consumption of raw milk is risky as it commonly associated with food born disease outbreaks. Therefore, this study aimed to identify the motivations for unpasteurized milk consumption among Malaysians. A total of 180 respondents had participated in this survey and a questionnaire was distributed via social media. The result revealed that majority of the consumers were female, Malay, aged between 21 to 30 years old, a bachelor degree holder and were living in an urban area. The motivation for raw milk consumption was dominated by the belief that raw milk possesses holistic health benefits followed by taste, prevention of immune-related disease, support for local farm and the belief that processed milk is not safe. The consumers had moderate knowledge about the health benefits and health risks associated with raw milk (M=3.30, SD=1.048). However, the majority of respondents weren't aware that selling raw milk is illegal in Malaysia. There was no significant difference between male and female consumers' perception regarding health benefits and health risk associated with raw milk (t=1.637, df= 69.037, p-value 0.11). The perceptions of the consumers between urban, sub-urban and rural areas also showed no significant difference F(1.064) = 0.35 at 95% confident interval.*

Keywords: *Raw milk, unpasteurized, milk-borne disease*

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Introduction

Raw (unpasteurized) milk is consumed directly without any process of pasteurization. Pasteurization is a heat treatment process of milk under milk's boiling point. Currently, three methods are being used to pasteurize milk; (i) low temperature pasteurization (vat) or batch pasteurization (62.8^{o}C for 30 min), (ii) Regular pasteurization (71.7^{o}C for 15s) and (iii) Ultra height temperature, UHT (137.8^{o}C for 2s) (Holsinger, V. H., Rajkowski, K. T., & Stabel, J. R., 1997). All these processes are used to kill pathogens present in the milk for safety milk consumption.

Since the outbreaks of raw milk foodborne disease from exposure to pathogenic bacteria in raw milk, raw milk consumption practice has been banned in most part of the world (Lucey, J. A. , 2015). However, between 2007 to 2012, a total of 27 cases related to raw milk consumption were reported in Europe which predominantly caused by *Campylobacter* spp., *C. jejuni*, and *Salmonella* Typhimurium ((BIOHAZ), 2015). In Malaysia, a study conducted showed that from 930 raw milk samples, approximately 90% were contaminated by coliform bacteria. Among microorganisms detected in the sample include *E. coli* (65%), *Staphylococcus aureus* (60%), *L. monocytogenes* (1.9%) and *Salmonella* sp (1.4%) (Chye, F. Y., Abdullah, A., & Ayob, M. K., 2004). In 2017, Terengganu, Malaysia, 36% out of 53 milk samples that were analyzed contained aflatoxins (Nadira, A. F., Rosita, J., Norhaizan, M. E., & Redzwan, S. M., 2017). *Aspergillus flavus* and *A. parasiticus* are the two types of fungi responsible for producing this toxic metabolite (Groopman, J. D., Cain, L. G., Kensler, T. W., & Harris, C. C., 1988). According to the regulation issued by the Ministry of Health Malaysia, the level of occurrence of Aflatoxins M1 (AFM_1) in milk and dairy products should be below 500ng/L (Nadira, A. F., Rosita, J., Norhaizan, M. E., & Redzwan, S. M., 2017).

Despite the alarming reports on contaminated raw milk, demand for raw milk is remains high global and locally. Based on studies, the demand for raw milks can be categorized into five motivation factors. The factors are (i) taste, (ii) immune related disease prevention, (iii) insecurity of pasteurized milk, (iv) social support and (v) holistic health benefits. Raw milk consumption, motivation and knowledge among consumers are differs across countries (Nadira, A. F., Rosita, J., Norhaizan, M. E., & Redzwan, S. M., 2017) (Groopman, J. D., Cain, L. G., Kensler, T. W., & Harris, C. C., 1988) (Francesconi, G. N., Heerink, N., & D'Haese, M., 2010). The main source of information of raw milk are word from people, personal experience and observation. To date, information of knowledge on raw milk, motivation of consumption and perception among Malaysian are unknown. The knowledge gap identified in this study can help healthcare authorities in devising appropriate strategies to educate consumer and dairy product producers. Therefore, it is important to determine the factors among Malaysian.

Research Methodology

Study Design

This study was adopted (Katafiasz, A. R., & Bartlett,, 2012) and modified into bilingual questionnaire; English and Bahasa Malaysia as considering the targeted respondents may have different language proficiency. A short and simple explanation about raw milk was included to assist the respondents to understand the questions. The questionnaire consisted with 21 items was developed into four sections; Section A (Demographic Data), Section B (Preferences ad Beliefs of Consumers on Raw Milk), Section C (Acquisition Pattern of Raw Milk) and Section

Volume: 5 Issues: 33 [November, 2020] pp. 8 - 16]
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D (Perception on Health Benefits and Health Risks associated Raw Milk). These sections were used to access raw milk consumers' demography, knowledge on benefits and risks of raw milk and their motive on consuming raw milk. All items were multiple choice questions except Section D which was 5-point Likert-type scale.

Data Collection

Convenience sampling was used to recruit participants as previously suggested (Zainal, I. N. A., Karim, N. A. A., Soh, Y. C., Suleiman, A. K., Khan, T. M., Hameed, M. A., .& Lean, Q. Y., 2017). The questionnaire was prepared in Google form and distributed using social media such as Facebook, Instagram and WhatsApp applications.

Data Analysis

The data was analyzed using the Statistical Package for Social Science (SPSS) software version 23. Frequency and percentage for each item were calculated. The relationship between the perceptions of the respondents with gender and residential area, independent sample t-test and ANOVA test were conducted.

Findings

Demographic data

A total of 180 participants responded to the survey which consist of 71.7% female (n = 129), 27.8% male (n = 50) and 0.6% categorized as others (n = 1). Majority of the respondent age was from 21 to 30 (76.7%) followed by 31 – 40 (9.4%) and 41 – 50 years old (3.3%). A similar trend was observed in California which majority of raw milk consumers age are below 40 years old (Headrick, M. L., Timbo, B., Klontz, K. C., & Werner, S. B., 1997). Recent study showed Malaysian food consumer's age ranging from 20 to 40 are prioritizing organic foods (Rezai, G., Mohamed, Z., Shamsudin, M. N., & Teng, P. K., 2011). In term of education, a total of 99.4% of respondents received formal education with 66.1% of them were bachelor holder. However, our finding is in contrast with consumerism data in Turkey in which most of the raw milk consumers were illiterate (Celik Ates, H., & Ceylan, M., 2010). Meanwhile, a total of 45% of the respondents live in urban residential (n = 81) followed by 29.4% rural (n = 53) and 25.6% sub-urban area (n = 46). Table 1 summarized demographic characteristic of the respondents. We would like to emphasis on low number of responds as participated participants based on volunteered respondents.

Table 1: Demographic data

	Frequency	Percentage (%)
Gender		
Male	50	27.8
Female	129	71.7
Others	1	0.6
Age		
Below 21	9	5.0
21-30	138	76.7
31-40	17	9.4
41-50	6	3.3
Above 50	10	5.6

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Education level		
Did not complete high school	1	0.6
SPM	13	7.2
STPM/ STAM	9	5.0
Diploma	23	12.8
Degree	119	66.1
Master	13	7.2
PhD	2	1.1
Residential Area		
Urban	81	45.0
Sub-urban	46	25.6
Rural	53	29.4

Motivation for consumption of raw milk

Motivation for raw milk consumption was divided into two; (1) based on preference and (2) the idea that consuming raw milk can help preventing diseases (Table 2). Majority of respondents choose 'holistic health benefits of raw milk' as their main preference (33.0%), followed by exquisite 'taste' of the raw milk (26.7%), 'immune related disease prevention' (14.4%) and the least known preference was 'doesn't feel processed milk is safe' (10.0%). Exquisite taste of raw milk was also nominated as the second reason of consumption by Greek society (Mitsostergios, K. T., & Skiadas, C. H., 1994). A few studies on motivation of raw milk consumption were also conducted in Slovakia, Stockholm and Sri Lanka in previous years. Their results concluded that beside holistic health benefits, raw milk taste also played an important role in motivating raw milk consumption (Mitsostergios, K. T., & Skiadas, C. H., 1994) (De Alwis, A. E. N., Edirisinghe, J. C., & Athauda, A. M. T. P. , 2011).

On the other hand, 14.4 % respondents believed that drinking raw milk will be helpful in preventing immune-related disease. This is in line with Sozanska's study which also claimed that raw milk is useful in developing immune system (Sozańska, B., Pearce, N., Dudek, K., & Cullinan, P. , 2013). The least number of respondents (12.2%) answered that they consume raw milk simply because they wanted to support local dairy farms. This reason has also been suggested by Katafiasz & Bartlett in their study which stated that consumers choose raw milk as a sign of their support to local dairy farms as well as to maintain good relationship with the family farmers (Francesconi, G. N., Heerink, N., & D'Haese, M., 2010). In Minnesota, most of the raw milk consumed originated from the farms which belong to the consumers' relatives (Robinson, T. J., Scheftel, J. M., & Smith, K. E., 2014). While others claimed that preference for raw milk is driven by their belief that processed milk have lost most of its beneficial nutrients due to heat treatment (Katafiasz, A. R., & Bartlett, P., 2012).

Consumption of raw milk was also influenced by the belief that it can prevent or cure diseases. In this study, majority of the respondents believed that by consuming raw milk, 'Tooth decay' can be prevented or slowed down (28.9%). Others believed that raw milk can reduce 'Intestinal problems' (23.9%) and 'Psoriasis' (3.3%). Consumption of milk was proven to slow down calcium depletion from aging body. For instance, osteoporosis risk can be reduced among elderly with regular intake of milk (Hong, H., Kim, E. K., & Lee, J. S., 2013). A total of seven (3.9%) respondents, especially Malays, believed raw goat milk could cure Jaundice among new born baby. This finding in agreement with previous study in Neonatal jaundice study (Boo, N.

Volume: 5 Issues: 33 [November, 2020] pp. 8 - 16]
Journal of Islamic, Social, Economics and Development (JISED)
eISSN: 0128-1755
Journal website: www.jised.com

Y., Gan, C. Y., Gian, Y. W., Lim, K. S., Lim, M. W., & Krishna-Kumar, H., 2011). Intestinal problem such as lactose malabsorption (lactose intolerance) is believed can be alleviated by consumption of raw milk. In 2014, a randomized controlled study found that raw milk ineffective to reduce lactose malabsorption among adult lactose intolerants (Lucey, J. A. , 2015) (Mummah, S., Oelrich, B., Hope, J., Vu, Q., & Gardner, C. D. , 2014).

Table 2: Raw milk consumption motivation.

	Frequency	Percentage (%)
Reasons for raw milk preference		
Taste	48	26.7
Immune related disease prevention	26	14.4
Doesn't feel processed milk is safe	18	10.0
Support local farm	22	12.2
Holistic health benefits	60	33.3
Others	6	3.3
Diseases thought to be helped/prevented		
Psoriasis	6	3.3
Allergies	24	13.3
Intestinal problems	43	23.9
Cold and flu	20	11.1
Tooth decay	52	28.9
Orthopaedic disease	28	15.6
Others	7	3.9

Perception on health benefits risks associated with raw milk

Overall respondents' perception on health benefits and risks associated with raw milk was positive (M = 3.30) (Table 3). Thus, it indicated that overall, they have knowledge on raw milk's benefits and risks. Item 1 was positively rated with a mean score of 3.72; SD (1.036). It shows that positive perception on whether raw milk is healthier than pasteurized milk is quite high among the respondents. High temperature of heat treatment for pasteurization denatures protein structures (Katafiasz, A. R., & Bartlett, P., 2012)] and decreases milk casein solubility. However, studies showed major nutrients (protein and lactose) were not affected by pasteurization process while calcium (0.11±0.02%) and phosphorus (0.10±0.2%) in pasteurized and raw milk are relatively similar (Lucey, J. A. , 2015) (do Nascimento, I. R., de Jesus, R. M., dos Santos, W. N., Souza, A. S., Fragoso, W. D., & dos Reis, P. S., 2010) (Douglas Jr, F. W., Greenberg, R., Farrell Jr, H. M., & Edmondson, L. F., 1981) (Claeys, W. L., Cardoen, S., Daube, G., De Block, J., Dewettinck, K., Dierick, K., ... & Vandenplas, Y., 2013)Thus, this indicated misconception on low nutrition values of in pasteurized milk in majority of the respondents. Without pasteurization process, raw milk is rich with nutrients and is susceptible for pathogen growth. This statement was well reflected by respondents in which Item 2 was scored positively (M = 3.08). In fact, selling raw milk directly to consumers without pasteurization in Malaysia is illegal. According to the Malaysia Food Act 1983 under Regulation 51 (1A) in the Food Hygiene Regulations 2009 (Amendment Regulations 2016) which come into operation on 1st December 2016, anyone who has been found guilty of selling raw milk can be charged with not more than RM10,000 or being jailed for not more than five years (Gazette, 2016). Majority of respondents realized the looming threat possessed by raw milk as for Item 3 'Raw milk should be legal to sell in Malaysia' statement has negative

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perception. This indicates that respondents were well aware of the threat and had an impression that government has an important role in insuring the quality and safety of milks before the product reach consumers. Several studies conducted on local raw milks indicated that the total bacterial load in the milks was within Malaysian Food Act 1983 and Food Regulation 1985 guideline (<5.0 log CFU/mL) (Shamila-Syuhada, A. K., Rusul, G., Wan-Nadiah, W. A., & Chuah, L. O., 2016). Even strict pasteurization milk regulation to prevent the threat, milk borne disease outbreak did occur with pasteurized milk (Mungai, E. A., Behravesh, C. B., & Gould, L. H., 2015).

Item 2 and Item 3 reflected the importance of food safety issue among respondents. However, for Item 4 'I have visited the farm where the raw milk that I drink is produced', negative perception was reflected by the respondents. This indicated that they were not cautious on gold standard of aseptic and hygienic aspects of raw milk production. The negative perception may due to distance between residential areas with milk production farms. Furthermore, acquisition process of the raw milk is via internet and milk delivery agents. Thus physical visit on the dairy farms were not possible. In 2011 to 2012 major case of *Brucella* sp. was emerged in Penang goat farm. A total of 88 patients infected were recorded including hospital staff. All of them consumed goat raw milk except four hospital staffs. A total of 41% of the patients fully recovered while 21% were relapsed. *Brucella* sp. infection occurred due to poor farm management system and unhygienic milking processes (Leong, K. N., Chow, T. S., Wong, P. S., Hamzah, S. H., Ahmad, N., & Ch'ng, C. C., 2015). In 2015, a significant bacterial load (> 10^7 CFU/mL) was reported in 216 raw milk samples obtained from Sabah, Malaysia. An investigation was conducted and poor hygienic handling among dairy farmers was found (Sim, K. Y., & Alam, M. R., 2015). Aseptic handling and food safety are major concerns in European countries. Five major hazardous agents were identified in raw milk that causes critical food poisoning and *Brucella melitensis* is one in the list ((BIOHAZ), 2015)

Table 3: Perception on health benefits and health risks associated with raw milk

Item No.	Items	Mean	SD
1	Raw milk is healthier than pasteurized milk	3.72	1.036
2	Drinking raw milk increases the risk of getting a foodborne disease.	3.08	1.116
3	Raw milk should be legal to sell in Malaysia.	2.27	1.029
4	Raw milk should be regulated by the government to ensure quality standards.	4.31	0.757
5	I have visited the farm where the raw milk that I drink is produced.	2.54	1.443
6	In general, I trust recommendations made by the Ministry of Health Malaysia regarding raw milk.	3.89	0.909
	Overall mean	3.30	1.048

Mean score: 1 – 1.99 = very negative; 2.00 – 2.99 = negative; 3.00 = neutral; 3.01 – 3.99 = positive; 4.00 – 5 = very positive.

Volume: 5 Issues: 33 [November, 2020] pp. 8 - 16]
Journal of Islamic, Social, Economics and Development (JISED)
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Comparison of raw milk health benefits and risk perception between gander and association between consumers' residential areas

Perception on health benefits and risks associated with raw milk was determined. Preliminary assumption showed male respondent perception was slightly higher compared to female with mean of M = 3.397±0.52 and M = 3.265±0.37 respectively (Table 4). An Independent Sample t-test was conducted to investigate significant of difference between ganders. However, there was no significant different between male and female perception on raw milk health benefits and health risk with *p-value* 0.11 at 95% confident interval. Thus, gender does not influence respondents' perception. The same result was obtained on different perception between respondents who live in urban, sub-urban and rural areas. One-way ANOVA result analysis indicated residential areas did not influence respondents' perception with F(1.064) = 0.35. Least Significant Different (LSD) was performed to validate one-way ANOVA and all p-values of each residence areas were larger than *p-value* 0.05.

Table 4: Descriptive Statistics for Male and Female Consumers' Perception

	Mean	Sig. of *P-value**
Gander		
Male	3.397±0.52	0.11
Female	3.265±0.37	
Residential Area		
Urban	3.338	0.35
Sub-urban	3.323	
Rural	3.233	

**P-value* is at 95% level of confident interval (P<0.05).

Conclusion

Motivation for raw milk consumption was dominated by the belief that raw milk possesses holistic health benefits. Most of the respondents have misconception as they perceived raw milk is healthier than pasteurized milk. Majority of respondents were literate and educated gander thus diminished gander and residence area as factors for knowledge gap. Further studies are required as current respondents was small and do not affirmed all respondents are raw milk consumer.

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