

## MOTIVATION FOR RAW MILK CONSUMPTION AMONG MALAYSIANS

Mohd Ikhmal Hanif Abdul Khalid<sup>1\*</sup>, Nuraini Mahrur<sup>2</sup>

<sup>1</sup>*Faculty of Pharmacy*

*Universiti Teknologi MARA UiTM Campus Bertam, 13200 Pulau Pinang*

<sup>2</sup>*Faculty of Education*

*Universiti Teknologi MARA UiTM Campus Puncak Alam, 42300 Selangor*

\*Corresponding author: mohdikhmal@uitm.edu.my

### 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 its 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, most respondents were not 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) at 95% confident interval.

**Keyword:** Milk-borne disease, Raw milk, Unpasteurized

### 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°C for 30 min), (ii) Regular pasteurization (71.7°C for 15s) and (iii) Ultra high temperature, UHT (137.8°C for 2s) (Holsinger et al., 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, 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* (EFSA Panel on Biological Hazard, 2015). In Malaysia, a study conducted showed that from 930 raw milk samples, approximately 90% was 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 et al., 2004). In 2017, Terengganu, Malaysia, 36% out of 53 milk samples that were analyzed contained aflatoxins (Nadira et al., 2017). *Aspergillus flavus* and *A. parasiticus* are the two types of fungi responsible for producing this toxic metabolite (Groopman et al., 1988).

According to the regulation issued by the Ministry of Health Malaysia, the level of occurrence of Aflatoxins M1 (AFM<sub>1</sub>) in milk and dairy products should be below 500 ng/L (Nadira et al., 2017).

Despite the alarming reports on contaminated raw milk, demand for raw milk is remains high global and locally. Based on previous 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 differ across countries (Groopman et al., 1988; Francesconi et al., 2010; Nadira et al., 2017). The main source of information of raw milk is word from people, personal experience and observation. Therefore, it is important to determine motivation and knowledge of raw milk consumption in Malaysia. To date, knowledge of raw milk, motivation of consumption and perception among Malaysia are unknown. The knowledge gap identified in this study can help healthcare authorities in devising appropriate strategies to educate consumer and dairy product producers.

## **Materials and Methods**

### **Study Design**

This study was adopted (Katafiasz & Bartlett, 2012) and modified into a set of bilingual questionnaires; English and Bahasa Malaysia as considering the targeted respondents may have different language proficiency. Experts were sought to evaluate consistency items in Bahasa Malaysia. A total of 337 respondents were projected based on online sample population calculator (<http://www.raosoft.com/samplesize.html>). A short and simple explanation about raw milk was included to assist the respondents to understand the questions. The questionnaire consisted of 21 items was developed into four sections; Section A (Demographic Data), Section B (Preferences and Beliefs of Consumers on Raw Milk), Section C (Acquisition Pattern of Raw Milk) and Section 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 of Likert-type scale.

### **Data Collection**

Convenience sampling was used to recruit participants as previously suggested (Zainal et al., 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. Normality of the data was determined using Kolmogorov-Smirnov Shapiro-Wilk tests. The relationship between the perceptions of the respondents with gender and residential area were identified using independent sample t-test and ANOVA test.

## **Results and Discussion**

### **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 respondents' 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 is below 40 years old (Headrick et al., 1997). Recent study showed Malaysian food consumer's age ranging from 20 to 40 are prioritize organic foods (Rezai et al., 2011). In terms 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 & Ceylan, 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 emphasize on low number of respondents as their participation was on voluntary basis.

**Table 1** Respondents' demographic data

	Frequency	Percentage (%)
<b>Gender</b>		
Male	50	27.8
Female	129	71.7
Others	1	0.6
<b>Age</b>		
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
<b>Education level</b>		
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
<b>Residential Area</b>		
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 & Skiadas, 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 besides holistic health benefits, raw milk taste also played an important role in motivating raw milk consumption which are agreed with our findings (De Alwis et al., 2011; Kurajdová et al., 2015).

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 Sozańska et al. (2013) which also

claimed that raw milk is useful in developing immune system (Sozańska et al., 2013). The least number of respondents (12.2%) answered that they consumed 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 (Katafiasz & Barlett, 2012). In Minnesota, most of the raw milk consumed originated from the farms which belong to the consumers' relatives (Robinson et al., 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 & Barlett, 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 et al., 2013). A total of seven (3.9%) respondents, especially Malays, believed raw goat milk could cure Jaundice among new born baby. This finding agreed with previous study on Neonatal jaundice study (Boo et al., 2011). Intestinal problem such as lactose malabsorption (lactose intolerance) can be alleviated by consumption of raw milk. In 2014, randomized controlled studies found that raw milk was ineffective to reduce lactose malabsorption among adult lactose intolerants (Lucey, 2015; Mummah et al., 2014).

**Table 2** Motivations of raw milk consumption

	Frequency	Percentage (%)
<b>Reasons for raw milk preference</b>		
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
<b>Diseases thought to be helped/prevented</b>		
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 and 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 & Barlett, 2012) and decreases milk casein solubility. However, studies showed major nutrients (protein and lactose) were not affected by pasteurization process while calcium ( $0.11 \pm 0.02\%$ ) and phosphorus ( $0.10 \pm 0.2\%$ ) in pasteurized and raw milk are relatively similar (Lucey, 2015; Claeys et al., 2013; do Nascimento et al., 2010; Douglas et

al., 1981). Thus, this indicated a 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 1<sup>st</sup> 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 (Akta Makanan 1983 Pindaan 2016). Majority of respondents realized the threat of raw milk as for Item 3 ‘Raw milk should be legal to sell in Malaysia’ statement has met with negative perceptions. This indicates that the respondents were aware of the threat and had an impression that government has an important role in ensuring 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 ( $<5.0 \log \text{CFU/mL}$ ) (Shamila-Syuhada et al., 2016). Even strict pasteurization milk regulation to prevent the threat, milk borne disease outbreak did occur with pasteurized milk (Mungai et al., 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 of gold standard of aseptic and hygienic aspects of raw milk production. The negative perception may be to the distance between residential areas and milk production farms. Nowadays, acquisition of the raw milk is via internet purchase and milk delivery agents. Thus, physical visits 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% relapsed. *Brucella* sp. infection occurred due to poor farm management system and unhygienic milking processes (Leong et al., 2015). In 2015, a significant bacterial load ( $> 10^7 \text{CFU/mL}$ ) 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 & Alam, 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 (EFSA Penal on Biological Hazard, 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 the 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

### Comparison of Raw Milk Health Benefits and Risk Perception between Gender 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 positive and slightly higher compared to female with mean of  $M = 3.397 \pm 0.52$  and  $M = 3.265 \pm 0.37$  respectively (Table 4). An Independent Sample t-test was conducted to investigate significant of difference between genders. 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.

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

	Mean	Sig. of <i>P-value</i> *
<b>Gender</b>		
Male	3.397±0.52	0.11
Female	3.265±0.37	

\**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 as healthier than pasteurized milk. Further studies are required as current respondents was small number and do not represent raw milk consumers.

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### Conflict of interests

The authors declare that there is no conflict of interest.

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