Systematic Review

Milk pasteurization is a process of heating on the standard temperature pressure to kill pathogens, which present in raw milk and improve its quality [1]. Proponents of milk products provide noticeable health benefits with a strong bone structure and teeth and prevent certain chronic health illnesses such as allergy, obesity, high blood pressure, and type 2 diabetes [2]. Communities in the world take milk from a variety of animals' source including; goats, public health threat with consumption of unpasteurized milk: Systematic Review

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I N T R O D U C T I O N

Unpasteurized milk consumption is common throughout the globe, despite the negative consequence for consumer health. This review paper identified public health risks resulting from unpasteurized milk. Several keywords were used to search online, including Google Scholar, PubMed, Science Direct, and academic publications. Significant data were rigorously extracted and reported as per the PRISMA statement guideline. Individuals' risk from consuming raw milk was examined in 15 studies. According to a laboratory investigation report, raw milk contained several parasites and harmful bacteria in unpasteurized milk. These include campylobacteriosis, brucellosis, Staphylococcus aureus, streptococcus, salmonellosis, E. coli 0157, and other hazardous poisons like Aflatoxin M1. People are exposed to pathogenic microorganisms, parasites, and other dangerous toxic agents while consuming raw milk. Therefore, ensuring the safety and quality of raw milk through implementing hazard-critical control points during production and distribution is mandatory in the dairy industry to safeguard general public health.
sheep, cows, and camels; these might be different from one country to another based on religious and cultural ground [3]. Certain nutrients and mineral contents in milk provided for a human to acquire extraordinary good health conditions, including; calcium, phosphorus, Riboflavin (B2), vitamin B12, potassium, vitamin A, zinc, and Magnesium [4-6]. Unfortunately, raw milk consumption could potentially cause several diseases for consumers. Since, milk and its products are the kind of perishable food that holds many essential nutrients, which is sensitive to microbial (pathogenic organisms) [7-8]. Some diseases are contagious diseases that spread out from animals to humans. It is estimated that approximately 75% of recently emerging infectious diseases, that affect human diseases were of animal origin; approximately 60% of all human pathogens are zoonotic [9-10]. Potential risk factors were milk handlers and animal's health conditions because, people exposed with certain pathogen via of direct contact with infected animals [1,11]. In many countries milk born outbreak were reported [12] and identified factors including milk handling, knowledge and environmental condition [9,13]. Safety and hygiene of milk problems were mainly affected due to lack of policy implementation, and inadequate infrastructure (agro-processing), which were key issues exacerbating risk to their health [6,14,15]. As evidence suggested that, milk borne disease mainly caused by consuming unprocessed milk [4,16-19,19]. Ideally, ordinary people believed that drinking milk as a raw condition saved nutritional value, which overlooking its safety and hygienic condition [20-23]. Studies showed that young and elders, pregnant women, and chronic and complicated health illness individuals are highly risk groups for zoonotic disease [1,3,19,24], this was confirmed that their level of immunity systems and other dietary pattern. For example, milk products, such as cream, cheese, and yogurt can be easily contaminated with harmful bacteria and cause serious infections, including Brucellosis, Campylobacteriosis, E. coli O157:H7, Salmonella, and Toxoplasmosis. Unlikely, certain microbes such as Staphylococcus aureus and E. coli O157:H7 are present in human and animal health, but cause serious illness and death occurs unless taken any medical treatment [25].

**Milk borne disease**

**Brucellosis**

Brucella is a bacterial microbe that originates in unpasteurized dairy products. Brucella infection, or Brucellosis, has also been called “Undulant Fever” because of the regular recurrence of fever associated with the disease. It is one of the possible causes of lengthy fever with unknown origin in children [9,26,27].

**Campylobacteriosis**

The bacteria are typically detected in the feces of infected animals and food products that have come into contact with the germs during processing or preparation. One of the main causes of human infection is consuming unpasteurized milk. Campylobacter spp., including C. jejuni and C. coli, are the leading causes of enteritis in humans. Patient with disease may experience symptoms such as diarrhea, fever, nausea, vomiting, headaches, and muscle discomfort [13].

**Cryptosporidiosis**

A coccidian parasite is known as Cryptosporidium species, which is carried by infected animals. People may expose with the disease due to consumption of unpasteurized milk and poor hand hygiene. Symptoms such as stomach pain, watery diarrhea, nausea, lack of appetite, vomiting, fever, and muscle pain were common [12,25,28].

**Escherichia coli O157:H7 (E. coli) infection**

Escherichia coli (E. coli) are a group of bacteria that inhabit the digestive tracts of both humans and animals. While majority of Escherichia coli are a natural component of the intestinal flora, some serotypes, like E. coli O157:H7 can cause intestinal disease (food poisoning) in humans, resulting in bloody diarrhea, hemolytic uremic syndrome (HUS), kidney failure [1,14,19,29].

**Listeriosis**

Listeria monocytogenes are bacterial disease that attacks ruminants and humans. It is excreted via feces. Unlike other bacteria, people who touch sick animals might be at risk of getting the disease. Pregnant women and immune-suppressed individuals need to refuse to consume unpasteurized dairy products [3,30].

**Salmonella**

Salmonellosis is a bacterial pathogen that is well-known for causing food-borne illnesses in humans. It is transmitted through eating and drinking improper or undercooked foods such as unpasteurized milk and dairy products, meat, eggs, and other animal products. Diseases with salmonellosis were including, feel abdominal discomfort, headache, fever, and diarrhea [19,31].

**Sarcocystosis**

The parasitic protozoan species known as Sarcocystis are found in unpasteurized milk. People got the disease through ingestion of the protozoan, most frequently undercooked and unsafe storage of animal products. Muscle tightness or painful swelling, weakness, headache, coughing, and temporary itching and rashes were some of the symptoms of the sarcocystosis-related disease, and symptoms such as fever, chills, sweating, chills, abdominal pain, diarrhea, nausea, and vomiting [25,28,32].

**Toxoplasmosis**

Toxoplasma gondii is a tiny protozoan parasite that causes severe human disease. Individuals may manifest in the symptoms such as fever, body aches, headaches, and sore
thorats). It is causing a dangerous condition for women during baby carriage.[33,34].

**Control of milk-born disease**

Raw milk is the most known for perishability and cause serious disease for consumers unless keep and follow safety protocol, which is recommended by the world health organization including: Hazard Analysis Critical Control Point (HACCP) and other quality check parameters to control against physical, chemical and biological hazard [7,20,22]. Implementing adequate control strategies assures quality and safe milk production through pasteurization and “Test and Hold” programs[6,14].

**METHODS**

This systematic review paper was developed using PRISM guideline [35]. Different searching electronic data based were used; these included Google Scholar, PubMed, Science Direct, and other academic papers from different university depository to identify the relevant papers on public health threats with consumption of unpasteurized milk. In addition, keywords such as “foodborne”, “Milk borne”, ”Raw milk”, “unpasteurized milk”, ”consumption” “children”, “elder”, “women”, “Human health”, “risk factors”, “milk handling”, “milk-borne outbreak”, and “prevention and control” were used and connected by using “OR” and “AND” to find more relevant papers. Furthermore, different studies were found out through cited reference list from all research papers. To develop this systematic review paper, pertinent studies were gathered. Experimental and epidemiologic investigations were included. Studies published in 2008–2022 reported pathogens related to the consumption of unpasteurized milk were addressed. Studies that were conducted before 2008 and investigated qualitatively were excluded from the review. Moreover, the corresponding authors were contacted through email whenever there were no full text available, and unanswered emails were excluded from the study. The outcome of the study was an isolated pathogen in raw milk and its effects on human health. Systematically data was extracted from the paper pre-designed format in the table and exported to all papers in the Medline reference database. The extraction process was adapted from the Joanna Briggs Institute (JBI) extraction format [36]. Relevant information was compiled in Microsoft Excel sheets by author and year, sample size, study design, region, milk-borne disease, and handling practice. The extracted format was developed based on the systematic objective of this study, and all authors participated to review independently the full text whenever disagreement happens between us resolved through discussion. The assessment of methodological quality, comparability, and outcome of each study was reviewed by all authors independently and using Newcastle Ottawa Scale (NOS) quality assessment protocol for a cross-sectional study[37].

**RESULTS**

This systematic review paper addressed the public health threat of consuming unpasteurized milk, and its implication to prevent milk-borne disease. Fifteen studies systematically identified and extracted valuable information regarding topic desire. The overall undertaken procedure performed to reach the final eligible paper was showed below in Fig1.

![Flow diagram of the existing milk-borne disease studies related to a public health threat](image)

**Characteristics of reviewed studies**

This paper included fifteen pieces of research that were done in various nations throughout the world and released in late 2008. Most of the included studies were experimental or observational. As per researcher reports, the study tried to analyze their findings and forward the message regarding the public health threat of consuming unpasteurized milk Table 1.

| Author | Country | Study type | Study design | Publication status |
|--------|---------|------------|--------------|-------------------|
| [13]   | Italy   | Quantitative | Cross-sectional | Published |
| [38]   | Iowa    | Observational | Cross-sectional | Published |
| [9]    | Iran    | Quantitative | Cross-sectional | Published |
| [16]   | Nigeria | Experimental | Cross-sectional | Published |
| [1]    | Ethiopia| Experimental | Cross-sectional | Published |
| [10]   | Ethiopia| Observational | Cross-sectional | Published |
| [19]   | Egypt   | Experimental | Cross-sectional | Published |
| [14]   | Finland | Experimental | Cross-sectional | Published |
The common milk-borne diseases reported by researchers included: campylobacteriosis, brucellosis, TB, Toxoplasmosis Gondi, Klebsiella, E. coli 0175, Pneumonia, Staphylococcus aureus and Salmonella species. Other studies also investigated and reported the epidemiological condition and distribution worldwide. People were seriously affected many times due to the direct consumption of unpasteurized milk.

Table 1: Included reviewed papers for public health threats with consumption of unpasteurized milk

| Author | Country | Study type | Study design | Publication status |
|--------|---------|------------|--------------|--------------------|
| [14]   | Uganda  | Quantitative | Cross-sectional | Published          |
| [33]   | Pakistan | Experimental | Case-Control   | Published          |
| [39]   | Italy    | Experimental | Cross-sectional | Published          |
| [26]   | Israel   | Experimental | Cross-sectional | Published          |
| [27]   | Iran     | Quantitative | Case-control   | Published          |
| [31]   | Serbia   | Quantitative | Retrospective  | Published          |
| [29]   | Egypt    | Experimental | Cross-sectional | Published          |

Table 2: Disease-related consumption of unpasteurized milk on human health

| Author | Participants | Total sample | Finding |
|--------|--------------|--------------|---------|
| [13]   | Child        | 378          | Campylobacteriosis cases of 2.12 and 1.14 and HUS cases of 0.02 and 0.09 were found in age 0 to 5-year, while 0.1 and 0.5 HUS in 5-year age group. |
| [38]   | Women aged 55-69 years | 22,808 | Among 2,379 cancer patients, participants reported consuming unpasteurized milk only as children (RR = 0.90, 95% CI: 0.82-0.99) or as children and adults (RR = 0.85, 95% CI: 0.76-0.97) had a lower age-adjusted risk of cancer. |
| [10]   | All age group | 480 | Among the respondents, 48 consumers self-report human Td case history. |
| [9]    | Children <15 years | 721 | Brucellosis infections cases had detected 103(22.4%) with a history of consuming raw milk products. |
| [33]   | Women aged 16-40 years | 360 | Bad pregnancy outcomes were significantly different among study (p<0.001). |
| [39]   | All age groups | 4985 | (Hepatocarcinoma) HCC occurrences related to the AFM1 intakes were 0.005 and 0.004 cases per 100,000 people, respectively. |
| [26]   | Children     | 15           | Brucella melitensis were positive in 50% of the children. |
| [27]   | All age groups | 300 | Brucellosis cases were associated with unpasteurized dairy product intake (OR = 3.7, p = 0.014) and OR = 7.55, p = 0.0001. |
| [31]   | All age groups | | There were 179 food-borne outbreaks were reported of which 2276 individuals were sick and one death. |

Table 3: Dangerous contents presented in raw milk

| Source of milk | Sample | Lab-diagnosed method | Hazards detected | Author |
|----------------|--------|-----------------------|------------------|--------|
| Cow milk       | 378    | Culture and biochemical test | Campylobacteriosis and hemolytic uremic syndrome detected | [13] |
| Camel(26), Cow(23) & Goat(87) | 135    | ultra-sensitive LC-MS/MS | Afatoxin M1 was detected in sampled cow and goat milk, with 13% and 55%, respectively. | [16] |
| Cow milk       | 315    | Culture and biochemical test | Escherichia coli, Klebsiella pneumonia, Staphylococcus aureus, K. oxytoca, and Citrobacter Freund | [1] |
| Cow milk       | 300    | Culture and biochemical test | From analyzed milk sample 36.66% and 56.66% harbored E. coli and Staphylococcus aureus respectively. | [11] |
| Cow milk       | 126    | Culture and biochemical test | Unpasteurized milk consumer RR 6.27(10.18-18.76) with Sorbitol-fermenting Escherichia coli 0157. | [19] |
| Cow milk       | 200    | Culture and biochemical test | Staphylococcus aureus (46%), coagulase-negative Staphylococcus aureus (28%), Escherichia coli (12%), Streptococcus agalactiae (8%) and Salmonella spp. (5%). | [14] |
| Cow milk       | 150    | Biochemical & serological | E. coli and Aeromonas hydrophila were examined in the milk sample with 32(21.3%) and 28(18.6%) respectively. | [14] |

D I S C U S S I O N

The finding of this systematic review found that significant results were provided with a review of fifteen papers. Raw milk consumed children were 2.21 times and 1.14 times more likely to acquire campylobacteriosis and hemolytic uremic syndrome than their counterparts [13]. Brucellosis occurred in 41.4 out of every 100,000 people. Among the participants, 170 patients (37 percent) had direct exposure to domestic animals, while 103 cases (22.4%) had a history of consuming raw milk products [9]. Similarly, 50% of investigated children consumed raw camel milk and confirmed brucellosis [26]. Another study found that among 300 patients, brucellosis was reported (OR = 7.55, p = 0.0001), of which unpasteurized dairy consumers were 3.7 times more likely than non-cased [27]. Moreover, the study found that unpasteurized milk consumers showed Toxoplasma Gondi in the specimen, which result in negative pregnancy outcomes [33]. The review study also found that 179 food-borne outbreaks were reported, and approved that unpasteurized milk was dominant to cause outbreaks, 2276 individuals were affected by numerous milk-borne...
C O N C L U S I O N

This review paper found that raw or unpasteurized milk contains pathogenic microorganisms and parasitic infections including: campylobacteriosis, salmonellosis, brucellosis, Staphylococcus aureus, streptococcus, E.coli 0157, Toxoplasmosis, and Afatoxin M1, which might cause life-threatening condition even death for consumers. Particularly, toddlers, children, pregnant mothers, and other immune-surprised individuals were highly susceptible and seriously affect their health.

C o n f l i c t s  o f  I n t e r e s t

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R E F E R E N C E S

[1] Berhe G, Wasihun AG, Kassaye E, Gebreselasie K. Milk-borne bacterial health hazards in milk produced for commercial purpose in Tigray, northern Ethiopia. BMC Public Health 2020; 20:1–8. doi:10.1186/s12889-020-09016-6.
[2] Lucey JA. Raw Milk Consumption: Risks and Benefits. Nutrition Today 2015; 50:189–93. doi:10.1097/NT.0000000000000108.
[3] Rahman MS, Hassan MM, Chowdhury S. Determination of antibiotic residues in milk and assessment of human health risk in Bangladesh. Heliyon 2021;7:e07739. doi:10.1016/j.heliyon.2021.
[4] Butler MI, Bastiaanssen TFS, Long-Smith C, Berding K, Morkl S, Cusack A-M, et al. Recipe for a Healthy Gut: Intake of Unpasteurised Milk Is Associated with Increased Lactobacillus Abundance in the Human Gut Microbiome. Nutrients 2020; 12:1468. doi.10.3390/nu12051468.
[5] Amenu K, Wieland B, Szonyi B, Grace D. Milk handling practices and consumption behavior among Borana pastoralists in southern Ethiopia. Journal of Health, Population and Nutrition. 2019; 38:6. doi.10.1186/s41043-019-0163-7.
[6] Caudell MA, Charoonsophonsak PV, Miller A, Lyimo B, Subbiah M, Buza J, et al. Narrative risk messages increase uptake and sharing of health interventions in a hard-to-reach population: A pilot study to promote milk safety among Maasai pastoralists in Tanzania. Pastoralism 2019; 9:7.doi.10.1186/s13570-019-0142-z.
[7] Denny J, Bhat M, Eckmann K. Outbreak of Escherichia coli 0157:H7 Associated with Raw Milk Consumption in the Pacific Northwest. Foodborne pathogens and disease. 2008; 5:321–8. doi:10.1089=fpd.2007.0072.
[8] Hoffmann V, Simiyu S, Sewell DK, Tsai K, Cumming O, Mumma J, et al. Milk Product Safety and Household Food Hygiene Influence Bacterial Contamination of Infant Food in Peri-Urban Kenya. Public health frontier. 2022; 9:1-12. doi.10.3389/fpubh.2021.772892.
[9] Khazaei S, Shojaeian M, Zamani R, Mansori K, Mohammadian-Hafshejani A, Rezaei-Langroodi R, et al. Epidemiology and risk factors of childhood Brucellosis in West of Iran. International journal of pediatrics. 2016; 4:2099–104.doi.10.22038/jip.2016.6966.
[10] Deneke TT, Bekele A, Moore HL, Mamo T,
Ali M et al.,

Milk and meat consumption patterns and the potential risk of zoonotic disease transmission among urban and peri-urban dairy farmers in Ethiopia. BMC Public Health 2022; 22:222. doi:10.1186/s12889-022-12665-4.

Almaw G, Mekonnen GA, et al. Milk and meat consumption patterns and the potential risk of zoonotic disease transmission among urban and peri-urban dairy farmers in Ethiopia. BMC Public Health 2022; 22:222. doi:10.1186/s12889-022-12665-4.

Gwida MM and EL-Gohary FA. Zoonotic Bacterial Pathogens Isolated from Raw Milk with Special Reference to Escherichia coli and Staphylococcus aureus in Dakahlia Governorate, Egypt 2013; 2:4–7. doi:10.4172/scientificreports.

Gould LH, Mungai E, Barton Behravesh C. Outbreaks Attributed to Cheese: Differences Between Outbreaks Caused by Unpasteurized and Pasteurized Dairy Products, United States, 1998–2011. Foodborne pathogens and disease. 2014; 11:545–51. doi:10.1089/fpd.2013.1650.

Giacometti F, Serraino A, Bonilauri P, Ostanello F, Daminelli P, Finazzi G, et al. Quantitative risk assessment of verocytotoxin-producing Escherichia coli O157 and Campylobacter jejuni related to consumption of raw milk in a province in Northern Italy. Journal of food protection. 2012;75:2031–8. doi:10.4315/0362-028X-JFP-12-163.

Majalija S, Tumwine G, Kiguli J, Bugeza J, Ssemadaali MA, Kazoora HB, et al. Pastoral community practices, microbial quality and associated health risks of raw milk in the milk value chain of Nakasongola District, Uganda. Pastoralism 2020; 10:3. doi:10.54393/pjhs.v3i04.135

Majalija S, Tumwine G, Kiguli J, Bugeza J, Ssemadaali MA, Kazoora HB, et al. Pastoral community practices, microbial quality and associated health risks of raw milk in the milk value chain of Nakasongola District, Uganda. Pastoralism 2020; 10:3. doi:10.54393/pjhs.v3i04.135

Namanda AT, Kacak R, Otsyula M. The role of unpasteurized hawked milk in the transmission of brucellosis in Eldoret municipality, Kenya. Journal of infection in developing countries. 2009;3:260–6.doi. 10.3855/jidc.122.

Akinyemi MO, Braun D, Windisch P, Warth B, Ezekiel CN. Assessment of multiple mycotoxins in raw milk of three different animal species in Nigeria. Food Control 2022;131:108258.doi.10.1016/j.foodcont.2022.108258.

Dubey JP, Verma SK, Ferreira LR, Oliveira S, Cassinelli AB, Ying Y, et al. Detection and Survival of Toxoplasma gondii in Milk and Cheese from Experimentally Infected Goats†. Journal of Food Protection. 2014;77:1747–53. doi.10.4315/0362-028X.JFP-14-167.

Grace D, Omore A, Randolph T, Kang’ethe E, Nasinyama GW, Mohammed HO. Risk Assessment for Escherichia coli O157:H7 in Marketed Unpasteurized Milk in Selected East African Countries. Journal of Food Protection. 2008;71:257–63.doi.10.4315/0362-028X-71.2.257.

Jaakkonen A, Salmenlinna S, Rimhanen-Finne R, Lundström H, Heinikainen S, Hakkinen M, et al. Severe Outbreak of Sorbitol-Fermenting Escherichia coli O157 via Unpasteurized Milk and Farm Visits, Finland 2012. Zoonoses Public Health 2017;64:468–75.doi.10.1111/zph.12327.

Sakalle S, Guleri S, Dixit S, Bhagwat A, Shukla H, Sirohi S. An assessment of behavior change regarding milk consumption in families consuming unpasteurized milk from street vendors in slum areas of Indore district. International Journal of Medical Science and Public Health. 2014;3:401. doi.10.1089/fpd.2009.0302.

Oliver SP, Boor KJ, Murphy SC, Murinda SE. Food Safety Hazards Associated with Consumption of Raw Milk. Foodborne Pathogens and Disease. 2009; 6:793–806. doi.10.1089/fpd.2009.0302.
[23] Khalid M and Mahror N. Motivation of Raw Milk Consumption Among Malaysians. GADING Journal of Science and Technology. 2020;3:26–33.

[24] Davidson JA, Loutet MG, Connor CO, Kearns C, Smith RMM, Lalor MK, et al. Epidemiology of Mycobacterium bovis Disease in Emerging infectious diseases. 2017; 23:377-86.

[25] Little CL and de Louvois J. Health risks associated with unpasteurized goats' and ewes' milk on retail sale in England and Wales. A PHLS Dairy Products Working Group Study. Epidemiology and Infection. 1999; 122:403-8. doi.10.1017/S0950268899002307.

[26] Shimol S Ben, Dukhan L, Belmaker I, Bardenstein S, Sibirsky D, Barrett C, et al. Human brucellosis outbreak acquired through camel milk ingestion in southern Israel. Israel Medical Association Journal. 2012;14:475-8.

[27] Sofian M, Aghakhani A, Velayati AA, Banifazl M, Eslamifar A, Ramezani A. Risk factors for human brucellosis in Iran: a case-control study. Journal of global infectious diseases. 2008; 12:157–61. doi.10.1016/j.jijd.2007.04.019.

[28] Yilmaz T and Moyer B. Outbreaks associated with unpasteurized milk and soft cheese: an overview of consumer safety. Journal of food protection. 2009;1-42.

[29] Zeinhom MMA and Abdel-Latef GK. Public health risk of some milk borne pathogens. Beni-Suef University Journal of Basic and Applied Sciences. 2014; 3:209-15. doi.10.1016/j.bjbas.2014.10.006.

[30] Ates HC and Ceylan M. Effects of socio-economic factors on the consumption of milk, yoghurt, and cheese: Insights from Turkey. British Food Journal 2010;112: 234–50. doi.10.1108/00070701011029110.

[31] Popovic-Vranjes A, Popovic M, Jevtic M. Raw milk consumption and health. Srpski Arhiv Za Celokupno Lekarstvo. 2015;143:87-92. doi.10.2298/SARH1502087P.

[32] Perkin MR. Unpasteurized milk: health or hazard? Clinical & Experimental Allergy. 2007; 37:627-30. doi.10.1111/j.1365-2222.2007.02715.x.

[33] Rehman F, Shah M, Ali A, Ahmad I, Sarwar MT, Rapisarda AMC, et al. Unpasteurised milk consumption as a potential risk factor for toxoplasmosis in females with recurrent pregnancy loss. Journal of Obstetrics and Gynaecology. 2020; 40:1106–10. doi.10.1080/01443615.2019.1702630.

[34] Brady MT, Byington CL, Davies HD, Edwards KM, Glode MP, Jackson MA, et al. Consumption of Raw or Unpasteurized Milk and Milk Products by Pregnant Women and Children. Pediatrics 2014; 133:175–9. doi.10.1542/peds.2013-3502.

[35] Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The Prisma 2020 statement: An updated guideline for reporting systematic reviews. British Medical Journal. 2021;372. doi.10.1136/bmj.n71.

[36] Munn Z, Tufanaru C, Aromataris E. Data extraction and synthesis. American journal of nursing science.2014;114:49–54. doi.10.1097/01.NAJ.0000451683.66447.89.

[37] Modesti PA, Reboldi G, Cappuccio FP, Agymanc C, Remuzzi G, Rapi S, et al. Cross Sectional Study Newcastle - Ottawa Quality Assessment Scale. PLoS One 2016;11:1–2.

[38] Sellers TA, Mas VAR, Ph.D DJ, M.D CE, Wang HA, Kumar N, et al. Unpasteurized Milk Consumption and Subsequent Risk of Cancer. Journal of Lasers in Medical Sciences. 2009; 24:777–86. doi.10.1007/s10552-008-9143-8.

[39] Serraino A, Bonilauri P, Kerekes K, Farkas Z, Giacometti F, Canever A, et al. Occurrence of Aflatoxin M1 in Raw Milk Marketed in Italy: Exposure Assessment and Risk Characterization. Frontiers in Microbiology.2019;10.doi.10.3389/fmicb.2019.02516