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STUDY LITERATURE Open Access

# *Systematic Review Faktor Risiko Infeksi Parasit Usus*
# Systematic Review of Risk Factor of Intestinal Parasite Infection

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***ABSTRAK***

***Latar Belakang:*** *Infeksi parasit usus adalah masalah umum di dunia. Infeksi parasit usus menyebabkan morbiditas, mortalitas dan komplikasi.*
***Tujuan:*** *Tujuan dari penelitian ini adalah untuk mengidentifikasi kejadian faktor risiko infeksi parasit usus dengan menggunakan tinjauan sistematis pada infeksi parasit usus terkait artikel yang dipublikasi.*
***Metode:*** *Populasi adalah artikel tentang prevalensi dan faktor risiko infeksi parasit antara tahun 2013 sampai 2019 yang berjumlah 35 artikel. Kriteria inklusi adalah penelitia yang mengkaji faktor risiko intestinal parasit dan menggunakan data primer. Kriteria inklusi adalah penelitian review dan menggunakan data sekunder. Data dianalsiis dengan analisis univariat dengan menghitung rata-rata, nilai minimum, nilai maksimum, dan frekuensi serta persentase.*
***Ulasan:*** *Hasil menunjukkan bahwa faktor risiko infeksi parasit usus yang paling banyak terjadi adalah karena usia, jenis kelamin, tempat tinggal, toilet, mencuci tangan dengan sabun sebelum makan, kebiasaan mengenakan sepatu, memotong kuku, makan makanan yang kurang matang, kebersihan pribadi, dan sumber air minum.*
***Kesimpulan:*** *Faktor risiko infeksi parasit meliputi faktor demgrafi, perilaku hidup bersih dan sehat dan gaya hidup. Memperbaiki pola hidup bersih dan sehat dan gaya hidup dapat mencegah terjadinya infeksi parasit.*

***Kata kunci****: faktor risiko, infeksi parasit usus, gaya hidup, systematic review*

***ABSTRACT***

**Background:** Intestinal parasites infection is a common problem in the world. Intestinal parasites infection causes morbidity, mortality, and complication.
**Objectives:** The purpose of this research was to identify the intestinal parasite infection risk factors by using a systematic review of intestinal parasite infection-related existing publications.
**Methods:** The population was the research paper about prevalence and risk factors for intestinal parasites infection from 2013-2019 and 35 studies. Inclusion criteria include a research paper that identifies risk factors for intestinal parasites disease and uses primary data for the research. The exclusion criteria in this paper are review research and research that use secondary data for the study. Data are presented in tabular form. Univariate analysis to see the average, minimum and maximum values, and frequency and percentage distribution.
**Discussion**: The results showed most risk factors for intestinal parasite infection are age, sex, residence, toilet, washing hand with soap before a meal, shoe-wearing habit, trimming nails, eating undercooked food, personal hygiene, and source of drinking water.
**Conclusions:** Intestinal parasites can occur in children, adolescents, and adults affected by demographic factors, clean and healthy lifestyle behaviours and lifestyle. Cleanliness, health, and lifestyle are aspects that need to be improved to prevent intestinal parasites.

**Keywords:** risk factor, intestinal parasites infection, lifestyle, systematic review

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## INTRODUCTION

Intestinal parasites are a common problem in the world. Amoebiasis, ascariasis, hookworm infection, and trichuriasis are among the most common infections in the world (WHO, 2019). Parasitic infections, caused by intestinal helminths and protozoan parasites, are among the most prevalent infections in humans in developing countries. Infection caused by intestinal helminths is a soil-transmitted helminth infection. Species of parasitic worms are transmitted by eggs present in human feces, which are contaminated the soil in areas where sanitation is poor.

Intestinal parasitic infections are distributed virtually throughout the world, with high prevalence rates in many regions. Soil-transmitted helminths infection occurs in more than 1.5 billion people or 24% of the world's population. Infections are widely distributed in tropical and subtropical areas, with the greatest numbers occurring in sub-Saharan Africa, the Americas, China, and East Asia. Over 267 million preschool-age children and over 568 million school-age children live in areas where these parasites are intensively transmitted and require treatment and preventive interventions (WHO, 2019).

Intestinal parasites cause significant morbidity and mortality in endemic countries. Morbidity is related to the number of worms harbored. In general, mortality from these infections is relatively low, however, complications are not common and many cases need hospital care. In many countries, malabsorptions, diarrheas, blood loss, impaired work capacity, and reduced growth rate due to intestinal parasitic infections constitute important health and social problems. Furthermore, other parasitic infections such as abdominal angiostrongyliasis, intestinal capillariasis and strongyloidiasis are of local or regional public health concerns. In many countries, endemic intestinal parasitic infections are closely related to economic and social developmental processes and therefore their control may be a sensitive issue, both socially and politically (WHO, 2019).

In children, the infected are nutritionally and physically impaired. The infection to affect the digestive absorption and metabolism of foods that can result in loss of protein, carbohydrates fats, vitamins, and blood in large quantities can also cause an impaired immune response to the plasma insulin-like a growth factor (IGF)-1, increasing levels of serum tumor necrosis the A (TNS) and lower concentrations of hemoglobin. Besides, it can cause various symptoms of diseases such as anemia, diarrhea, the syndrome dysentery, iron deficiency anemia, and so the infection with a worm gut is a group of high risk for malnourished. This situation is in can cause a growth problem (Nursalim, Sari, & Aidinna, 2018).

The greater proportion of infections is associated with poor water, sanitation, and hygiene (WASH) (Gizaw, Adane, Azanaw, Addisu, & Hailed, 2018). In developing countries, intestinal parasite infections are major health problems. Epidemiological surveys on the intestinal parasite infections are important in this country because they reflect the sanitary conditions of the community and produce basic data for the control of parasitosis in the future.

There have been many publications that have reviewed the risk factors for intestinal parasites infection. Some research about the risk factors of intestinal parasites infection is inconsistent. Age and education have a significant effect on intestinal parasites infection (Bahrami et al., 2018), contrarily in Ashok et al. (2013) studied that age and education is an insignificant effect on intestinal parasites infection insignificant. The source of drinking water is a significant effect on intestinal parasites infection (Bakarman, Hegazi, & Butt, 2019), contrarily in Bahrami et al. (2018) studied. The inconsistency of the results of research on risk factors for intestinal parasites infection makes it interesting to study. This is because by conducting a review, it can determine the risk factors that most influence intestinal parasites infection.

Knowledge of risk factors for intestinal parasites infection can be a solution in preventing intestinal parasites infection. Therefore, this study uses a quantitative meta-analysis to systematically study research studies relating to intestinal parasites infection risk factors. The purpose of research using a systematic review approach is to find out the most risk factors for intestinal parasites infection based on the results of publications in health journals Public.

## METHOD

This study used a systematic review method. The data source of this study was derived from the literature obtained through the internet in the form of research results from publications in journals. A systematic review of intestinal parasite risk factors was then performed following PRISMA guidelines. The searches were conducted in Hindawi, PubMed, emedicalj, tandfonline, knepublishing, portalnepas, ojs unud, plos, jurnal.umsb, and publications were assessed against inclusion and exclusion criteria. For the scoping review, study and participant characteristics of included publications and key results were extracted and tabulated.

The population is the research paper about prevalence and risk factors for intestinal parasites infection from 2013-2019 and 35 studies were used. Inclusion criteria were researched that identifies risk factors intestinal parasites infection, use primary data for the research, and in Indonesian and English. Data collection was carried out on September 1 until 7 October 2019. The sample of the research consisted of ages 0 years to more than 60 years. Exclusion criteria were review study and use secondary data for the study. Data are presented in tabular form. Univariate analysis to see the average, minimum and maximum values, and frequency and percentage distribution.

## RESULT AND DISCUSSION

The results of the screening research paper identified 35 research on risk factors of intestinal parasites infection. The general description of the risk factor of intestinal parasites infection was listed in Table 1. Intestinal parasites infection 21 studies, Intestinal helminthic infection 12 studies and 2 studies did not explain in detail the type of parasite. The study was conducted with an age range of 0 to more than 60 years. A total of 25 studies are in the school-age range. The study examined the number of samples studied varied from 50 to 80.727 people and all of them are primary data. The research design used in the entire study was cross-sectional. The variables studied consist of 1 to 25 variables, and there are about 1 to 7 research variables that are significantly at intestinal parasites infection.

Table 2 showed that of the 35 studies studied, there were 49 variables studied consisting of patient characteristics, parental characteristics, and lifestyle of the respondents. Variable characteristics of parents and respondent characteristics studied were 21 variables and lifestyle consisted of 28 variables. The most studied variables were washing hand with soap before meal 20 studies (57.14%), sex 19 studies (54.28%), shoe-wearing habit 19 studies (54.28%), age 16 studies (45.71%), toilets 16 studies (45.71%), source of drinking 11 studies (31.42%), eating undercooked food 11 studies (31.42%), and trimming nails 10 studies (28.57%), respectively. Other risk factors associated with intestinal parasites infection include education, father's educational level, mothers' knowledge, residence, mothers education, parents' educational level, parents jobs, mothers jobs, fathers jobs, parents' income, jobs, knowledge, monthly income, family members, student grade, season, go to river, reason for referrals, wealth status, number of animal owned, raised dog, raised cat, raised animal at home, barangay variance, household variance, anemia, nutritional status, contact with domestic animal, floor house condition, municipal tap network, daily bath, washing hand with soap after toilet, treatment of the waste, waste disposal system, swimming habit, wearing boots in the field, using soil as a medium for playing, use of anthelmintic drugs, personal hygiene, and sanitation.

Based on the variables examined by several studies related to risk factors for intestinal parasites infection, in this study the variables are divided into two groups i.e. variables that can be controlled and variables that cannot be controlled. The variables that cannot be controlled entry into the variable of respondent characteristics and variables that can be controlled entry into the lifestyle variable.

**Tabel 1.** Screening research paper of risk factor of intestinal parasites infection

| Number | Name | Year | Region | Number of Samples | Age | Indication | Prevalence (%) | Design | Variable | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | Researched | Sig |
| 1 | Bakarman, Hegazi and Butt | 2019 | Elementary School in Jeddah Western Saudi Arabia | 581 | 11,65 ± 1,83 | Intenstinal parasites infection | 5,3 | Cross sectional | 23 | 5 |
| 2 | Hernandez et al. | 2019 | Rural School in Colombia | 97 | 9,46 ± 2,62 | Intenstinal parasites infection | 46,4 | Cross sectional | 19 | 3 |
| 3 | Sitotaw, Mekuriaw dan Damtie | 2019 | Jawi Primary School NorthWest Ethiopia | 406 | 6-21 | Intenstinal parasites infection | 58 | Cross-sectional | 12 | 6 |
| 4 | Asires, Wubie and Reta | 2019 | Prison East and West Gojjam Ethiopia | 416 | 28 ±10,59 | Intenstinal parasites infection | 61,9 | Cross-sectional | 6 | 6 |
| 5 | Bahrami et al. | 2018 | Kurdistan, Northwest Iran | 1383 | < 6 - > 50 | Intenstinal parasites infection | 21,5 | Cross-sectional | 9 | 4 |
| 6 | Suntaravitun and Dokmaikaw | 2018 | Rural Communities of Chachoengsao Province Thailand | 224 | < 21 - > 60 | Intenstinal parasites infection | 16,1 | Cross-sectional | 15 | 4 |
| 7 | Islamudin, Suwandono and Saraswati | 2018 | Elementary School Candi Vilage Semarang jawa tengah Indonesia | 71 | 6->12 | Intestinal helminthic infection | 11,3 | Cross-sectional | 1 | 1 |
| 8 | Yang et al. | 2018 | Elementary School in Southwestern China | 321 | 12,47 ± 1,91 | Intenstinal parasites infection | 25,2 | Cross-sectional | 16 | 2 |
| 9 | Kahar | 2018 | Elementary School Barombang Makasar Indonesia | 50 | 6- >12 | N/A | 36,0 | Cross-sectional | 3 | 2 |
| 10 | Feleke | 2018 | Elementary School in Bahir Dar Africa | 80727 | 6- > 12 | Hookworm infection | 22,3 | Cross-sectional | 7 | 7 |
| 11 | Butera et al. | 2018 | Children in Rural area Rutsiro District Rwanda | 353 | < 2 | Intenstinal parasites infection | 44,8 | Cross-sectional | 10 | 2 |
| 12 | Novianty et al. | 2018 | Preschool Children in Farmland North Sumatera Indonesia | 90 | 31,7 month | Intestinal helminthic infection | 34,4 | Cross-sectional | 9 | 5 |

| Num-ber | Name | Year | Region | Number of Samples | Age | Indication | Prevalence (%) | Design | Variable | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | Researched | Sig |
| 13 | Punsawad et al. | 2018 | Primary schoolchildren in Nakhon Si Thammarat Southern Thailand | 299 | 7-12 | Intenstinal parasites infection | 16 | Cross-sectional | 10 | 2 |
| 14 | Shrestha et al. | 2018 | Schoolchildren in Dolakha and Ramechhap district Nepal | 708 | 8-16 | Intenstinal parasites infection | 39,7 | Cross-sectional | 25 | 4 |
| 15 | Ross et al. | 2017 | Laoang and Palapag, Northern Samar Philippines | 6976 | < 15 - > 35 | Intestinal helminthic infection | 75,6 | Cross-sectional | 9 | 5 |
| 16 | Samuel et al. | 2017 | Elementary School Ambo Western Ethiopia | 321 | 6->12 | Intestinal helminthic infection | 12,6 | Cross-sectional | 5 | N/A |
| 17 | Irfan and Delima | 2017 | Elementary School in Padang Indonesia | 61 | 6->12 | N/A | 52,5 | Cross-sectional | 2 | 2 |
| 18 | Dewi and Laksmi | 2017 | Elementary School Delod Peken Tabanan Bali Indonesia | 105 | 6->12 | Intestinal helminthic infection | 7,6 | Cross-sectional | 6 | 3 |
| 19 | Liao et al. | 2017 | Scoolchildren in Battambang Cambodia | 308 | 6-16 | Intenstinal parasites infection | 50,3 | Cross-sectional | 14 | 1 |
| 20 | Safitri, Nofita and Pertiwi | 2017 | Elementary School 27 Olo Padang Indonesia | 59 | 6-12 | Ascariasis | 20,3 | Cross-sectional | 4 | 1 |
| 21 | Mukutmoni and Khanum | 2017 | Children of Begun Bari Slum Tejgaon Dhaka Bangladesh | 159 | 1-15 | Intestinal helminthic infection | 6,92 -27,67 | Cross-sectional | 6 | 5 |
| 22 | Choi and Kim | 2017 | Schoolchildren in the peripheral Highland Regions of Huanuco Peru | 185 | 10,1 ± 2,9 | Intenstinal parasites infection | 74,1 | Cross-sectional | 12 | 1 |
| 23 | Wiryadana et al. | 2017 | Elementary School in Bali Indonesia | 126 | 9,98 ± 2,22 | Intestinal helminthic infection | 31,7 | Cross-sectional | 14 | 3 |
| 24 | Banhos et al. | 2017 | Elementary School Children in Santarem Para State Brazil | 367 | 4-12 | Intenstinal parasites infection | 67,5 | Cross-sectional | 6 | 4 |
| 25 | Feleke | 2016 | School age Children in Bahir Dar City Ethiopia | 2372 | 5-19 | Intenstinal parasites infection | 5-19 | Cross-sectional | 6 | 6 |

| Num-ber | Name | Year | Region | Number of Samples | Age | Indication | Prevalence (%) | Design | Variable Researched | Variable Sig |
|---|---|---|---|---|---|---|---|---|---|---|
| 26 | Syahrir and Aswadi | 2016 | Elementary School in Inpres 1 Wora Wera Bima Indonesia | 91 | 6 - > 12 | *Ascaris Lumbricoides, Trichuris Trichiura, Hookworm* | 59,3 | Cross-sectional | 4 | 2 |
| 27 | Kartini | 2016 | Elementary School in Rumbai pesisir Pekanbaru Indonesia | 2610 | 6-12 | Intestinal helminthic infection | 16,3 | Cross-sectional | 13 | 7 |
| 28 | Kumar et al. | 2016 | Pre primary School Kiwanga Rural Ward Bagamoyo Tanzania | 115 | 3-6 | Intestinal helminthic infection | 3,8 | Cross-sectional | 11 | N/A |
| 29 | Malavade | 2015 | School Childen in El Salvador | 1310 | 8-10 | Intestinal helminthic infection | 1,83-4,1 | Cross-sectional | 5 | 4 |
| 30 | Tefera, Mohammed and H Mitiku | 2015 | Babile town, eastern Ethiopia | 644 | 10,45±2,9 | Intestinal helminthic infection | 13,8 | Cross-sectional | 3 | 2 |
| 31 | Sandy, Sumarni and Soekoyo | 2014 | Arso District, Keerom Regency, Papua | 224 | 6-12 | Hookworm infection | 66,9 | Cross-sectional | 14 | 1 |
| 32 | Workneh, Esmael and Ayichiluhm | 2014 | Primary School East Gojjam Zone , Amhara North West Ethiopia | 541 | 12,4 ± 2,08 | Intenstinal parasites infection | 84,3 | Cross-sectional | 5 | 3 |
| 33 | Mekonnen, Erko and Legesse | 2014 | Street Dwellers in Addis Ababa Ethiopia | 355 | 28,4 ± 12,4 | Intenstinal parasites infection | 71,8 | Cross-sectional | 8 | N/A |
| 34 | Ashok et al. | 2013 | Amalapuram, Andhra Pradesh, India | 208 | 8,8 ± 2,11 | Intenstinal parasites infection | 63,94 | Cross-sectional | 10 | 3 |
| 35 | Abate et al. | 2013 | Teda Health Centre, Northwst Ethiopia | 410 | < 14 - > 45 | Intenstinal parasites infection | 62,3 | Cross-sectional | 9 | 4 |

**Table 2.** Research Results Risk Factors of Intestinal Parasites Infection

| Variable | Sig | Reference | No Sig | Reference | Total |
|---|---|---|---|---|---|
| Age | 8 | Bahrami et al.; Suntaravitun and Dokmaikaw; Bakarman, Hegazi and Butt; Feleke; Feleke; Sitotaw, Mekuriaw dan Damtie; Punsawad et al. ; Shrestha et al. | 8 | Ashok et al.; Tefera, Mohammed and Mitiku; Abate et al.; Ross et al. ; Yang et al. ; Hernandez et al.; Butera et al. ; Liao et al. | 16 |
| Sex | 4 | Tefera, Mohammed and Mitiku; Ross et al. ; Suntaravitun and Dokmaikaw; Feleke | 15 | Ashok et al.; Bahrami et al; Abate et al.; Sandy, Sumarni and Soekoyo; Kartini; Dewi and Laksmi; Sitotaw, Mekuriaw dan Damtie; Yang et al. ; Hernandez et al.; Butera et al. ; Liao et al.; Punsawad et al. ; Wiryadana et al.; Banhos et al. ; Shrestha et al. | 19 |
| Education | 2 | Bahrami et al; Ross et al. | 2 | Abate et al.; Suntaravitun and Dokmaikaw | 4 |
| Fathers' educational level | | | 1 | Ashok et al. | 1 |
| Mothers' knowledge | | | 2 | Safitri, Nofita and Pertiwi; Choi and Kim | 2 |
| Residence | 4 | Ashok et al.; Malavade; Feleke; Asires, Wubie and Reta | 4 | Bahrami et al.; Bakarman, Hegazi and Butt; Sitotaw, Mekuriaw dan Damtie; Shrestha et al. | 8 |
| Mother's education | 2 | Ashok et al.; Mukutmoni and Khanum | 2 | Bakarman, Hegazi and Butt; Sitotaw, Mekuriaw dan Damtie | 4 |
| Parents' educational level | | | 3 | Bakarman, Hegazi and Butt; Hernandez et al.; Sandy, Sumarni and Soekoyo | 3 |
| Parents' job | 1 | Butera et al. | 2 | Bakarman, Hegazi and Butt.; Sandy, Sumarni and Soekoyo | 3 |
| Mothers' job | 1 | Kartini | | | 1 |
| Fathers' job | 1 | Kartini | | | 1 |
| Parents' income | 2 | Safitri, Nofita and Pertiwi; Banhos et al. | 2 | Hernandez et al.; Sandy, Sumarni and Soekoyo | 4 |
| Job | 1 | Ross et al. | 2 | Bahrami et al.; Suntaravitun and Dokmaikaw | 3 |
| Knowledge | 1 | Asires, Wubie and Reta | | | 1 |
| Monthly income | | | 3 | Suntaravitun and Dokmaikaw; Bakarman, Hegazi and Butt.; Asires, Wubie and Reta | 3 |
| Family members | 2 | Feleke; Hernandez et al. | 3 | Suntaravitun and Dokmaikaw; Yang et al. ; Choi and Kim | 5 |
| Grade student | 2 | Tefera, Mohammed and Mitiku; Workneh, Esmael and Ayichiluhm | | | 2 |
| Season | 1 | Bahrami et al. | | | 1 |
| Go to river/lake | 1 | Ross et al. | | | 1 |

| Variable | Sig | Reference | No Sig | Reference | Total |
|---|---|---|---|---|---|
| Reason for refferal | 1 | Bahrami et al. | | | 1 |
| Wealth status | 1 | Ross et al. | 1 | Butera et al. | 2 |
| Number of animal owned | | | 2 | Ross et al. ; Butera et al. | 2 |
| Raised dog | 1 | Suntaravitun and Dokmaikaw | | | 1 |
| Raised cat | | | 1 | Suntaravitun and Dokmaikaw | 1 |
| Raised animal at home | 1 | Liao et al. | 1 | Choi and Kim | 2 |
| Barangay variance | | | 1 | Ross et al. | 1 |
| Household variance | | | 2 | Ross et al. | 2 |
| Anemia | | | 1 | Sandy, Sumarni and Soekoyo | 1 |
| Nutritional status | | | 2 | Sandy, Sumarni and Soekoyo; Islamudin, Suwandono and Saraswati | 2 |
| Source of drinking water | 4 | Bakarman, Hegazi and Butt; Malavade; Hernandez et al. ; Banhos et al. | 7 | Bahrami et al.; Sitotaw, Mekuriaw dan Damtie; Butera et al. ; Punsawad et al. ; Liao et al.; Choi and Kim; Shrestha et al. | 11 |
| Contact with a domestic animal | | | 5 | Bahrami et al.; Bakarman, Hegazi and Butt; Yang et al. ; Punsawad et al. ; Shrestha et al. | 5 |
| Toilet | 5 | Abate et al.; Mukutmoni and Khanum; Feleke; Feleke; Sitotaw, Mekuriaw dan Damtie | 11 | Ashok et al.; Suntaravitun and Dokmaikaw; Kartini; Sandy, Sumarni and Soekoyo; Syahrir and Aswadi; Bakarman, Hegazi and Butt; Butera et al. ; Novianty et al.; Choi and Kim; Punsawad et al. ; Wiryadana et al. | 16 |
| Floor House condition | 1 | Mukutmoni and Khanum | 4 | Ashok et al.; Kartini; Sandy, Sumarni and Soekoyo; Hernandez et al. | 4 |
| Municipal tap network | | | 1 | Ashok et al. | 1 |
| Daily bath | | | 1 | Ashok et al. | 1 |
| Washing hand with soap after toilet | 5 | Ashok et al.; Abate et al. ; Novianty et al.; Yang et al. ; Asires, Wubie and Reta | 4 | Sandy, Sumarni and Soekoyo; Bakarman, Hegazi and Butt; Liao et al.; Wiryadana et al. | 9 |
| Washing hand with soap before meal | 13 | Kartini; Syahrir and Aswadi; Kahar; Dewi and Laksmi; Feleke; Yang et al. ; Sitotaw, Mekuriaw dan Damtie; Novianty et al.; Asires, Wubie and Reta; Punsawad et al. ; Banhos et al.; Choi and Kim; Shrestha et al. | 7 | Abate et al.; Suntaravitun and Dokmaikaw; Sandy, Sumarni and Soekoyo; Mukutmoni and Khanum; Bakarman, Hegazi and Butt; Liao et al.; Wiryadana et al. | 20 |
| Trimming nails | 8 | Kartini; Syahrir and Aswadi; Kahar; Mukutmoni and Khanum; Sitotaw, Mekuriaw dan Damtie; Novianty et al.; Asires, Wubie and Reta; Wiryadana et al. | 2 | Bakarman, Hegazi and Butt; Dewi and Laksmi | 10 |
| Treatment of the waste | 1 | Kartini | 2 | Sitotaw, Mekuriaw dan Damtie; Banhos et al. | 3 |
| Source of water supply | 2 | Workneh, Esmael and Ayichiluhm; Yang et al. | 7 | Abate et al.; Sandy, Sumarni and Soekoyo; Kartini; Syahrir and Aswadi; Bakarman, Hegazi and Butt; Novianty et al.; Shrestha et al. | 9 |

| Variable | Sig | Reference | No Sig | Reference | Total |
|---|---|---|---|---|---|
| Shoe wearing habit | 9 | Abate et al.; Sandy, Sumarni and Soekoyo; Mukutmoni and Khanum; Malavade; Feleke; Feleke; Workneh, Esmael and Ayichiluhm; Sitotaw, Mekuriaw dan Damtie; Wiryadana et al. | 10 | Suntaravitun and Dokmaikaw; Kartini; Kahar; Dewi and Laksmi; Hernandez et al. ; Bakarman, Hegazi and Butt; Novianty et al.; Punsawad et al. ; Liao et al.; Choi and Kim | 19 |
| Water disposal system | 2 | Kartini; Banhos et al. | 1 | Shrestha et al. | 3 |
| Swimming habit | 1 | Abate et al. | 1 | Workneh, Esmael and Ayichiluhm | 2 |
| Wearing boots inthe field | 1 | Suntaravitun and Dokmaikaw | | | 1 |
| Eating undercooked food | 5 | Feleke; Sitotaw, Mekuriaw dan Damtie; Yang et al.; Butera et al. ; Novianty et al. | 6 | Suntaravitun and Dokmaikaw; Bakarman, Hegazi and Butt; Hernandez et al.; Liao et al. ; Choi and Kim; Punsawad et al. | 11 |
| Using soil as medum for playing | 2 | Kartini; Dewi and Laksmi | 4 | Punsawad et al.; Liao et al. ; Wiryadana et al.; Sandy, Sumarni and Soekoyo | 6 |
| Use of anthelmintic drug | 2 | Kartini; Wiryadana et al. | 1 | Workneh, Esmael and Ayichiluhm | 3 |
| Personal Hygiene | 4 | Irfan and Delima; Dewi and Laksmi; Feleke; Feleke | 1 | Safitri, Nofita and Pertiwi | 5 |
| Sanitation | 3 | Irfan and Delima; Safitri, Nofita and Pertiwi; Malavade | 1 | Shrestha et al. | 4 |

**Table 3.** The results based on the characteristics of respondents

| Variable | Result | | | | Total |
|---|---|---|---|---|---|
| | Sig | Sig. Sample | No Sig | No Sig. Sample | |
| Age | 8 (50%) | 1383; 224; 581; 80727; 2372; 406; 299; 708 | 8 (50%) | 208; 644 ; 410; 6976; 321; 97; 353; 308 | 16 |
| Sex | 4 (21,05%) | 644; 6976; 224; 80727 | 15 (78,95%) | 208; 1383; 410; 224; 2620; 105; 406; 321; 97; 353; 299; 308; 126; 367; 708 | 19 |
| Fathers' educational level | - | - | 1 (100%) | 208; 410 | 1 |
| Mothers' konwledge | - | - | 2 (100%) | 59; 185 | 2 |
| Residence | 4 (50%) | 208; 1310; 80727; 416 | 4 (50%) | 1383; 581; 406; 708 | 8 |
| Mother's educational level | 2 (50%) | 208; 105 | 2 (50%) | 581; 406 | 4 |
| Parents' educational level | - | - | 3 (100%) | 224; 581; 97 | 3 |
| Parents' job | 1 (33%) | 353 | 2 (67%) | 224; 581 | 2 |

| Variable | Result | | | | Total |
|---|---|---|---|---|---|
| | Sig | Sig. Sample | No Sig | No Sig. Sample | |
| Mothers' job | 1 (100%) | 2610 | - | - | 1 |
| Fathers' job | 1 (100%) | 2610 | - | - | 1 |
| Parents' income | 2 (50%) | 59; 367 | 2 (50%) | 224; 97 | 4 |
| Grade student | 1 (50%) | 541 | 1 (50%) | 644 | 2 |
| Educational level | 1 (33%) | 1383 | 2 (67%) | 410; 6976 | 3 |
| Job | - | - | 1 (100%) | 1383 | 1 |
| Konowledge | 1 (100%) | 416 | - | - | 1 |
| Montly income | - | - | 3 (100%) | 224; 581; 416 | 3 |
| Family members | 2 (40%) | 2372; 97 | 3 (60%) | 224; 321; 185 | 5 |
| Wealth status | 1 (50%) | 6976 | 1 (50%) | 353 | 2 |
| Anemia | - | - | 1 (100%) | 224 | 1 |
| Nutritional status | - | - | 2 (100%) | 224; 71 | 2 |
| Season | 1 (100%) | 1383 | - | - | 1 |

Based on the characteristics of the respondents, from 35 studies of risk factors for intestinal parasites infection, most of them used the sex variables of 19 studies (%) and the age of 16 studies (%). Results from the study of the significance of intestinal parasites infection risk factors are 4 studies (21.05%) is caused by sex, 8 studies (50%) is caused age. Mothers' jobs, fathers' jobs, and knowledge reported having a significant effect on intestinal parasites infection in all studies studied (100%). Residence, mothers' educational level, parents' income, student grade, and wealth status are reported to have a significant effect on intestinal parasites infection 50% of all studies studied. Family members are reported to have a significant influence on intestinal parasites infection 40% of all studies studied. Job and educational level parents are reported to have a significant influence on intestinal parasites infection 30% each of the studies. Fathers' educational levels, mothers' knowledge, parents' educational levels, jobs, monthly income, anemia, nutritional status are reported to have an insignificant effect on intestinal parasites infection in all studies.

**Table 4.** The results based on lifestyle

| Variable | Result | | | | Total |
|---|---|---|---|---|---|
| | Sig. | Sig. Sample | No Sig. | No Sig. Sample | |
| Toilet | 5 (31,25%) | 410; 105; 80727; 2372; 406 | 11 (68,75%) | 208; 224; 2610; 91; 581; 353; 299; 126; 185 | 16 |
| Floor House condition | 1 (20%) | 105 | 4 (80%) | 208; 224; 2610; 97 | 5 |
| Reason for refferal | 1 (100%) | 1383 | - | - | 1 |
| Go to river/lake | 1 (100%) | 6976 | - | - | 1 |
| Number of animal owned | - | - | 2 (100%) | 6976 | 2 |
| Barangay variance | 1 (100%) | 6976 | - | - | 1 |
| Household variance | 1 (50%) | 6976 | 1 (50%) | 581 | 2 |

| Variable | Result | | | | Total |
|---|---|---|---|---|---|
| | Sig. | Sig. Sample | No Sig. | No Sig. Sample | |
| Raised dogs | 1 (100%) | 224 | - | - | 1 |
| Rasied cats | - | - | 1 (100%) | 224 | 1 |
| Raised animal at home | 1 (50%) | 308 | 1 (50%) | 6976; 185 | 2 |
| Municipal tap network | - | - | 1 (100%) | 208 | 1 |
| Daily bath | 1 (100%) | 208 | - | - | 1 |
| Washing hand with soap after toilet | 3 (37,5%) | 208; 90; 416 | 5 (62,5%) | 224; 581; 321; 308; 126 | 8 |
| Washing hand with soap before meal | 13 (65%) | 2610; 91; 50; 105; 581; 80727; 406; 90; 416; 299; 367; 185; 708 | 7 (35%) | 410; 224; 105; 581; 321; 308; 126 | 20 |
| Trimming nails | 8 (80%) | 2610; 91; 50; 105; 406; 416; 126; 708 | 2 (20%) | 105; 581 | 10 |
| Source of drinking water | 4 (33,33%) | 581; 1310; 97; 367 | 8 (66,67%) | 1383; 406; 321; 353; 299; 308; 185; 708 | 12 |
| Waste disposal system | 2 (66,67%) | 2610; 367 | 1 (33,33%) | 708 | 3 |
| Source of water supply | 2 (22,22%) | 541; 321 | 7 (77,78%) | 410; 224; 2610; 91; 581; 90; 708 | 9 |
| Treatment of waste | - | - | 3 (100%) | 2620; 406; 367 | 3 |
| Contact with domestic animal | - | - | 5 (100%) | 1383; 581; 321; 299; 708 | 5 |
| Shoe wearing habit | 9 (47,37%) | 410; 224; 105; 1310; 80727; 2372; 541; 406; 126 | 10 (52,63%) | 224; 2610; 50; 105; 581; 97; 90; 299; 308; 185 | 19 |
| Swimming habit | 1 (50%) | 410 | 1 (50%) | 541 | 2 |
| Wearing boots in the field | 1 (50%) | 224 | - | | 1 |
| Eating undercooked food | 5 (45,45%) | 2372; 406; 321; 353; 90 | 6 (54,54%) | 224; 581; 97; 299; 308; 185 | 11 |
| Using soil as medium for playing | 2 (33,33%) | 2610; 105 | 4 (66,67%) | 224; 299; 308; 126 | 6 |
| Use of anthelmintic drug | 2 (66,67%) | 2610; 126 | 1 (33,33%) | 541 | 3 |
| Personal Hygiene | 4 (80%) | 61; 105; 80727; 2372 | 1 (20%) | 59 | 5 |
| Sanitation | 3 (75%) | 61; 59; 1310 | 1 (25%) | 708 | 4 |

Based on lifestyle, from 35 studies of risk factors for intestinal parasites infection, most used the variable washing hand with soap before meal 20 studies (57.14%), toilets were 19 studies (54.28%) and Shoe wearing habits were 19 studies (54.28%). The results of the variable that significantly affect intestinal parasites infection are 13 studies (65%) washing hands with soap before a meal, 5 studies (31.25%) toilet, and 9 studies (47.37%) shoe wearing a habit. Other variables that significantly influence intestinal parasites infection are explained as follows. Reason for referral, go to the river, barangay variance, raised a dog, daily bath, are reported to have a significant effect on intestinal parasites infection in all studies (100%).

Trimming nails 8 studies (80%), personal hygiene 4 studies (80%), sanitation 3 studies (75%), the use of anthelmintic drug and waste disposal system each of the 2 studies (66.7%), household variance, raised animals at home, swimming habits, wearing boots in the field 1 studies (50%), eating undercooked food 5 studies (45.45%), washing hand with soap after toilet 3 studies (37.5%), source of drinking water 4 studies (33.33%), using soil as a medium for playing 2 studies (33.3%), and source of water supply 2 studies (22.22%) that were reported to have a significant effect on intestinal parasites infection. The number of animals owned, raised cats, Municipal tap networks, treatment of waste, and contact with domestic animals have reported no significant effect on intestinal parasites infection in all studies.

Research on intestinal parasites infection has been carried out and has been explained many findings related to risk factors, both those that can be controlled and those that cannot be controlled. Based on the results of a review of several scientific article publications representing research findings on worm disease risk factors in the form of research and publication in journals. The number of research samples is also increasing both those from school age, adults and infants under 2 years and the variables studied are increasingly diverse and complete. All studies reviewed related to risk factors for intestinal parasites infection in this study were 35 studies using cross-sectional studies.

Factors that are at risk for helminthiasis can be grouped into two, i.e risk factors that can be controlled and risk factors that cannot be controlled. Individual characteristics are factors that cannot be controlled. The variables examined from 35 studies included in the characteristics of respondents were gender, age, mothers 'job, fathers' job, knowledge, residence, mothers 'educational level, parents' income, student grade, and wealth status, family, parents job, educational level, fathers' educational level, mothers' knowledge, parents' educational level, jobs, monthly income, anemia, and nutritional status. Among these variables, the variables that significantly affect intestinal parasites infection are sex, age, mothers 'job, fathers' job, knowledge, residence, mothers 'educational level, parents' income, student grade, wealth status, family member, parents job, and educational level. Meanwhile, fathers' educational level, mothers' knowledge, parents' educational level, jobs, monthly income, anemia, nutritional status are reported insignificant effects on the incidence of helminthiasis in all studies studied.

Parents' income, family member and wealth status are related to the fulfillment of children's nutrition which can affect the child's immune system. Children who are fulfilled with good nutrition will increase endurance and become less easily infected by parasites. Knowledge, mothers' educational level and educational level relate to knowledge about parasitic infections so that the knowledge they have can be the basis for taking reactive actions against parasitic infections. The ages examined in this study varied,

The prevalence of intestinal parasites infection was significantly higher in males (22.7%) than females (11.8%) (Suntaravitun & Dokmaikaw, 2018). The same thing was stated by Ross et al. (2017) that the prevalence of intestinal parasites infection in male (50.6%) was higher than female (49.4%). Suntaravitun and Dokmaikaw (2018) state that intestinal parasite infections are found more in more than 40 years old. In children, the prevalence of intestinal parasites is more common at the age of fewer than 13 years (Berhanu Elfu Feleke, 2016).

Variables that can be controlled are grouped into lifestyle factors. Variables examined from 35 studies included in the lifestyle are washing hands with soap before meal, toilet, shoe-wearing habit, reason for referral, going to river, barangay variance, raised dog, daily bath, trimming nails, personal hygiene, sanitation, use of anthelmintic drugs, waste disposal systems, household variance, raised animals at home, swimming habits, wearing boots in the field, eating undercooked food, washing hands with soap after toilet, source of drinking water, using soil as a medium for playing, source of water supply, number of owned animals, raised cats, Municipal tap networks, treatment of waste, and contact with domestic animals. Among these variables, variables that significantly affect intestinal parasites infection are washing hand with soap before meal, toilet, shoe-wearing habit, reason for referral, going to river, barangay variance, raised dog, daily bath, trimming nails, personal hygiene, sanitation, use of anthelmintic drugs, waste disposal systems, household variance, raised animals at home, swimming habits, wearing boots in the field, eating undercooked food, washing hands with soap after toilet, source of drinking water, using soil as a medium for playing , and source of water supply. Meanwhile, the number of animal owned, raised cats, municipal tap networks, treatment of waste, and contact with domestic animals reported no significant effect on helminthiasis in all studies studied.

Eating undercooked food is a risk factor of intestinal parasite infection. The most common detected intestinal parasite was B. hominis has a significantly higher prevalence in developed countries that could be related to contamination of food or water supplies and poor hygienic conditions (Bakarman et al., 2019). Shoe wearing habit is a significant effect on intestinal parasite infection. Footwear was a vital factor for helminth

infection because having no footwear showed a higher prevalence (76.03%) than having foot ware (34.21%). Non-hand wash users (80%) and irregular nail trimmer (90%) were also more prone to helminth infestation. Long nail is a contributing factor for acquiring and ingesting egg of parasites more easily. Usually, children who pick up and eat food from the ground, possess a higher risk of helminth infection. Moreover, in the slum areas, meals remain unveiled and exposed to heavy wind, domestic animals containing parasite eggs. Treatment with anthelminthic drugs reduces the transmissibility of parasites by reducing worm load and shedding of eggs (Mukutmoni & Khanum, 2017). Intestinal parasite infections are important health problems among underprivileged children. Exposure to infection is influenced by climate, poverty, ignorance, lack of access to safety measures and personal hygiene. These infections affect the psychological and physical development of a child. Therefore, an extensive design is necessary to implement a proper control strategy to mitigate these infections.

## CONCLUSIONS

The results of the systematic study analysis, it is known that the most risk factors for intestinal parasite infection are age, sex, residence, toilet, washing hand with soap before a meal, shoe-wearing habit, trimming nails, eating undercooked food, personal hygiene, and source of drinking water. Based on demographics, various intestinal parasite studies show that age, sex, and residence as dominant risk factors for intestinal parasite infection. Based on lifestyle, toilets, washing hands with soap before meals, shoe-wearing habits, trimming nails, eating undercooked food, personal hygiene, sources of drinking water are the major risk factors identified in various intestinal parasite infection studies.

Inconsistent research results regarding parasitic intestinal risk factors give rise to vague knowledge about parasitic intestinal risk factors. This research provides clarity regarding the most common risk factors in parasitic intestinal risk factors so that it becomes one of the studies that contribute to the development of the health sector. In the future, studies on intestinal parasite infection studies involving other variables besides characteristics and lifestyles such as social, economic and cultural variables.

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