Review Article

Scabies- Major Childhood Skin Infestation in Bangladesh - An Updated Review

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Abstract

Background: Globally distributed scabies- a highly prevalent contagious skin disease particularly infests children and elderly population. Since scabies often remain un-recognized/un-diagnosed or under-reported, but >130 million people suffer from scabies, WHO listed it under neglected tropical disease (NTD).

Objective(s): This updated review focus on scabies etiology and association with socio-economic profile, water sanitation, personal hygiene, poor living condition, and environmental pollution. However, few plausible risk factors of childhood scabies have also been covered in this review.

Methodology: A through computer-based literature search was performed for the period of ~two decades (2000 through 2022) utilizing four familiar search engines: Google Scholar, PubMed, Scopus and Elsevier. The search topics covered: 'childhood/adult scabies', 'etiology', 'risk factors', 'monthly income', 'water sanitation 'personal hygiene', 'living conditions' and few others (optional).

Findings: Of total 28 published articles reviewed conducted in major lower/mid income countries (LMICs) including some rich and Western ones. Overall findings revealed <12 years-old children were infested more, which was reported in more higher portions from Bangladesh alike other Afro-Asian countries. Scabies is attributed to overcrowded lower socioeconomic community, lack in knowledge/practice of poor personal hygiene, polluted environment/water-sanitation. Clinically, it is associated with intense generalized pruritus causing rash, itching/scratching, particularly during winter season. One of our community-based studies in residential Madrasahs in and around Dhak city/outskirts yielded that sharing habits of daily personal belongings (personal clothing, bed linen /towels, pajamas/lungis, etc.) were main sources of scabies transmission/scabies mite: *Sarcoptes Scabiei*. Alike our observations, treatment of scabies included Lot. Benzyl benzoate, Monosulfirum cream/soap, Permethrin cream, and, Lot. Ivermectin/cream for severe cases as best effective drugs to eradicate scabies mites which most of the literature agreed to irradicate scabies in ~90% children.

Conclusion: Scabies, more in children and elderly people, remains associated with overcrowding, bizarre living, moist/stuffy environment, poor personal hygiene, sharing personal cloths/towels, including other factors like parental sociodemographic status and poorer household income. Public Health policy makers should address immediate intervention to mitigate these factors to ensure effective prevention and control of scabies, both among the children and elderly people.

Key words: Childhood Scabies, Etiology, Re-infection, Risk factors, Prevention, Control, Treatment, Bangladesh

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1. Introduction:

Scabies is mostly a tropically endemic skin infestation being one of the most contagious diseases in the world for centuries, flaring up as large epidemics. Occurrence of scabies is related to low socio-economic conditions, overcrowding, poor personal hygiene and social disruptions (violence, wars etc.). Since scabies- a contagious disease has a considerably high prevalence rate.[1] Thus, scabies has been enlisted in WHO-listed neglected tropical disease (NTD) since 2017, although it often remains un/under-diagnosed, un-reported and so keeping this communicable skin disease un-recognized, globally. That's why, WHO adopted scabies under NTD-roadmap 2021-2030, aiming to seize ignoring it which would boost attaining UN's universal goal of SDG (Sustainable Development Goal),[1] where Bangladesh remains a signatory of it, too.

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Discomfort of often-intractable itching, remains one of the important precursors for systemic bacterial sepsis often leading to post-streptococcal glomerulonephritis as secondary bacterial /pyoderma. In addition to clinical signs/symptoms, definitive diagnosis of scabies needs microscopic visualization of mites/borrows from skin scrapping, though treatment is often given on clinical suspicion being more common. Endemic scabies is reported from areas lacking in facilities of clinical care and treatment in many Afro-Asian and Latino countries including Bangladesh.[2-4]

2. Background:

2.1 The Parasitic skin infestation-scabies

Human scabies is a parasitic infestation caused by *Sarcoptes scabiei* var hominis. The microscopic mite burrows into the skin and lays eggs, eventually triggering a host immune response that leads to intense itching and rash.[5] Scabies infestation may be complicated by bacterial infection, leading to the development of skin sores that, in turn, may lead to the development of more serious consequences such as septicemia, heart disease and chronic kidney disease.[6]

Scabies is one of the most contagious skin diseases in Bangladesh being more who lives in overcrowded places, in close contact and share personal belongings (cloth; gamcha/towel, bed sheet /linens) that helps transmitting scabies mites more easily. Further scabies occurs more among people having unhealthy living style, poor personal hygiene, polluted water sanitation and families under poverty, which remains plausible risk factors of infesting with scabies.[1] More detailed scenarios on etiology, clinical spectrum, epidemiology of Scabies including its **prevention and control** are described below (sections 2.2 through 2.5)

2.2 Etiological background of scabies:

Scabies is more common among lower socio-economic communities who live in dirty/squalid surrounding, unhealthy environment, and in overcrowded areas. It is also more common among people with poor personal hygiene due to poor water sanitation, low household budget, lack of cleanliness and unhygienic housing and living conditions.[3, 5, 7]

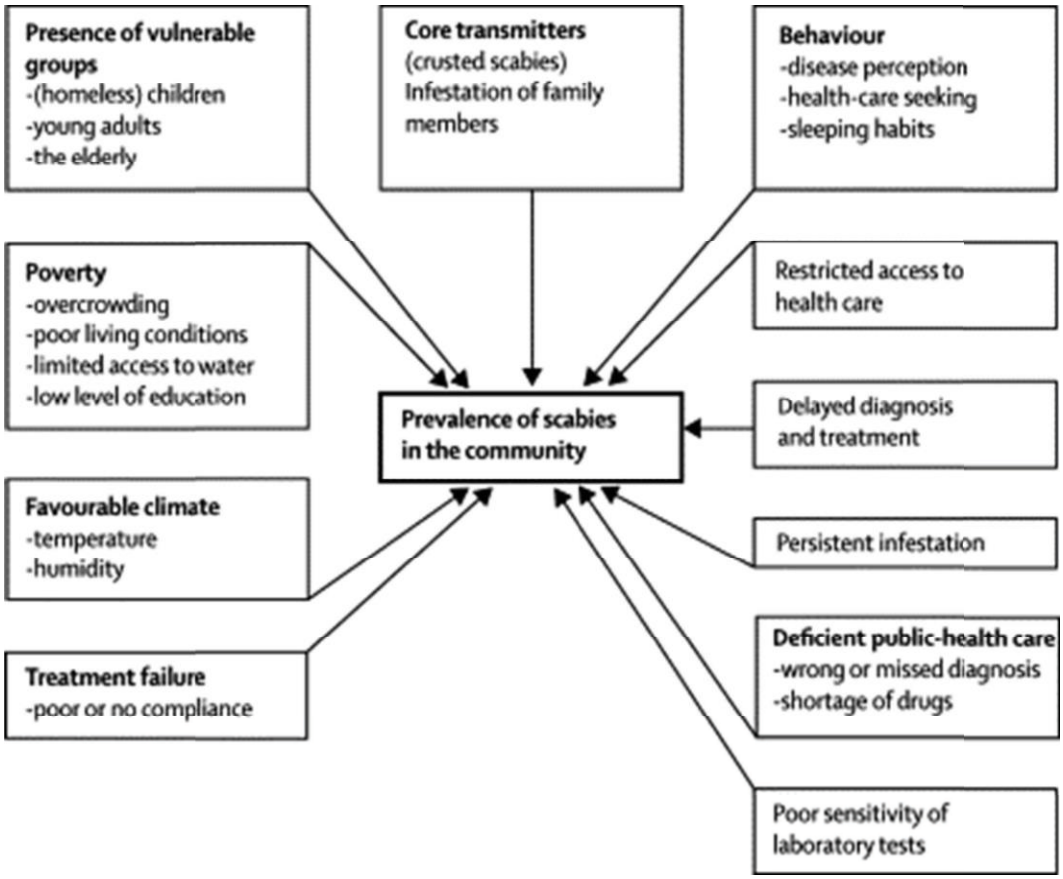

Figure-1: *Factors contributing to a high prevalence of scabies in resource-poor communitiesies*[6]

Most of the research on scabies has been carried out in urban settings, and has focused on the prevalence or clinical aspects of scabies. Since clinic-epidemiological data (particularly socio-economic aspects) on scabies largely lack in most rural communities, generation of such data, particularly on institutional outbreaks may be left out or some cases remain unidentified or untreated, as we observed in most residential Madrasahs where no or few studies on scabies were conducted.[7]

2.3 How the scabies mite looks under microscope

Scabies mite (Sarcoptes Scabiei) is too tiny to see with naked eyes. Their lengths are only about half of a millimeter, which includes eight legs, among them the anterior four are large in size and used for digging into the skin of an individual, and the posterior four are much smaller. They can also use their mouth as suction for holding on to human skin.[5] Figure- 2 below demonstrates the how the scabies mite Sarcoptes Scabiei looks like to infest human beings causing a wide range of dermatological lesions.[4]

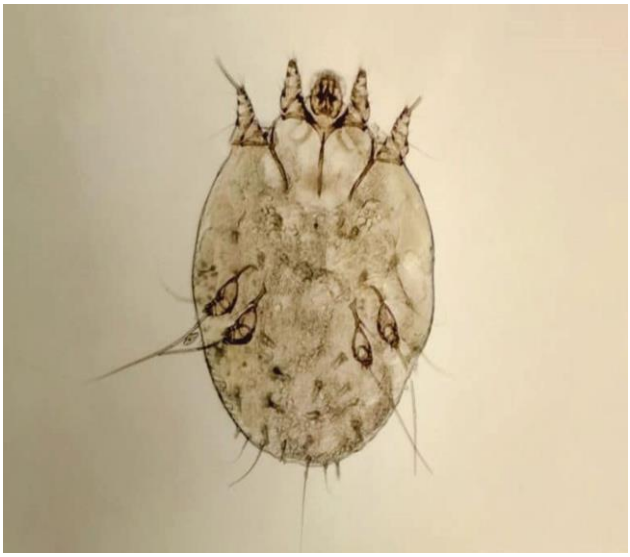

Figure-2: Microscopic vies of *Sarcoptes Scabiei* the scabies mite that hatch eggs on the skin surface (epidermis) [8]

2.4 Clinico-epidemiological aspect of Scabies

The microscopic skin parasite known by its scientific name as *Sarcoptes scabiei'* is called as scabies mite- which not only makes infestation into human skin but also make infections. Scabies mites are not visible on naked eyes. They infest on the top most layers of skin, where they lay their eggs and reproduce. This causes immune reaction of varied severity from skin infestation to inflammation that results in red bumps and rashes, associated with intense itching and a wide range of infections.[9,10]

2.5 Prevention and Control of Scabies:

Since Scabies is highly contagious a skin disease (infestation ⟶ infections ⟶ Complications) prevention remains the basic principle for limiting scabies including the control of this disease, towards destroying, or irradiating *Sarcoptes scabiei*, the scabies mites.

Yet, successful prevention and management rely on scabies mite eradication in ~90% children- as our institutional based findings after two rounds of successive treatment.

According to WHO (2005) basic recommendations has been suggested for improving hygiene and sanitation as the most likely means to benefit from scabies, as Rod J Hay reported.[11] Thus, considering prevention of childhood scabies, basic recommendations is to improve hygiene and sanitation, and avoiding overcrowding living, bizarre sleeping and not sharing personal belongings (dresses, towels, bedding, linens, etc.)

Since scabies has been reported to directly associate with poverty/ less monthly household income, it automatically raises the question on the feasibility/cost-effectiveness of associated measures which seem necessary to obtain a significant impact to avoid scabies from affected communities. Due to severe budgetary constraints and lack of mass-awareness on the etiology, transmission and prevention of scabies effective public health intervention through mass training and awareness building deem essential almost in all developing countries to get rid of scabies, permanently.

3. Aims/Objectives:

Based on reviewing selected existing literature this study aim to evaluate the etiology and plausible risk factors of scabies, including the socio-economic profile, water sanitation facilities, personal hygiene, living conditions that reportedly aggravate childhood scabies.

4. Methodology

4.1 Study design: Retrospective study (based on reviewing charts/data and/or related info/map) nearly similar to that of a systemic review).

4.2 Literature Review Matrix: A literature review matrix serves a researcher to help organizing one's thoughts on an article/ literature. This is only one option of many that can help you organize your thoughts; can easily change first section to reflect the write up [12]

4.3 Study type: Updated review article on childhood scabies

4.4 Information/ data-retrieval mechanism: Finding out literatures, review articles, original articles, journals, case reports from the following search engines:

- Google scholar = 25
- PubMed = 10
- Scopus = 5
- Elsevier = 4

4.5 Searching literature for the period from 2000 through 2022.

4.6 Countries where study was conducted: Mainly global but prioritizing Bangladesh.

4.7 Subject headings: 'Childhoods Scabies: clinico-epidemiology, housing environmental aspects, no. of family members/house, family income, poverty status, etc.

4.8 Selection of scabies endemic countries: Studies included review article quantitative studies, qualitative studies, from India, Pakistan, Malaysia, Ghana, Lithuania, Iran, Albania but in rich countries (UAE, Saudi Arabia) including in western ones (Canada, USA, etc.).

4.9 Search terms were related to scabies included "children", etiology", "and risk factors", "water sanitation". Search terms for the topic of interest included "personal hygiene", "global scenario", "living condition", "socio-demographic status", "socio-economic status".

4.10 Data Collection and Data Management (Analysis):

All data collected either utilizing a literature matrix (annexed) or directly from website and/or using search engines and were checked for sources, accuracies and duplicate entries and were screed to remove.

Data were extracted following a uniform way by author, year, country, aim, research design, sample, participants, and relevant findings. Relevant findings were those that related to the inclusion criteria. To ensure accuracy, another investigator cross-checked the extracted data of all included studies using the full-text study.

5. Results and findings:

Of all the 44 literatures reviewed over the span of 22 years (2000 - 2022) the following findings were extrapolated from randomly picked 28 articles as shown in 'Literature Matrix' (attached at the end of this updated review. However, major highlights were focused on one of our published papers in ***Public Health*** (published by London Royal Society of Public Health, UK) back in 2007. [7]

It was thus emphasized more only due to its potentiality un terms of first ever published original article on Scabies from Bangladesh encompassing such a wider spectrum (prevalence, clinico-epidemiological findings, transmission of scabies mites through overcrowded bizarre living in residential Madrasahs). [7]

5.1 Region specific global burden of scabies in different countries[9]

The region-specific global distribution of scabies in various countries have been depicted from one of the recent the published manuscript in 2017 by Chante Karimkhani, et al, titled '**The global burden of scabies a cross-sectional analysis from the Global Burden of Dis Study 2015**' published in ***The Lancet Infect Dis,*** [9]

East Asia: China, North Korea, and Taiwan (province of China)

Oceania: American Samoa, Federated States of Micronesia, Fiji, Guam, Marshall Islands, North Mariana Islands, Papua N Guinea, Samoa, Solomon Islands, Tonga, Vanuatu

Southeast Asia: Cambodia, Indonesia, Laos, Malaysia, Maldives, Mauritius, Myanmar, Philippines, Sri Lanka, Seychelles, Thailand, Timor-Leste, and Vietnam

South Asia: Bangladesh, Bhutan, India, Nepal, and Pakistan

Central Asia: Armenia, Azerbaijan, Georgia, Kazakhstan, Kyrgyzstan, Mongolia, Tajikistan, Turkmenistan, and Uzbekistan

Central Europe: Albania, Bosnia and Herzegovina, Bulgaria, Croatia, Czech Republic, Hungary, Macedonia, Poland, Romania, Serbia, Slovakia, and Slovenia

Eastern Europe: Belarus, Estonia, Latvia, Lithuania, Moldova, Russia, and Ukraine

North Africa and Mid East: Afghanistan, Algeria, Bahrain, Egypt, Iran, Iraq, Jordan, Kuwait, Lebanon, Libya,

Morocco, Palestine, Oman, Qatar, Saudi Arabia, Sudan, Syria, Tunisia, Turkey, United Arab Emirates, and Yemen

Western sub-Saharan Africa: Benin, Burkina Faso, Cameroon, Cape Verde, Chad, Côte d'Ivoire, The Gambia, Ghana, Guinea, Guinea-Bissau, Liberia, Mali, Mauritania, Niger, Nigeria, São Tomé and Príncipe, Senegal, Sierra Leone, and Togo

Southern sub-Saharan Africa: Botswana, Lesotho, Namibia, South Africa, Swaziland, Zimbabwe

Eastern sub-Saharan Africa: Burundi, Comoros, Djibouti, Eritrea, Ethiopia, Kenya, Madagascar, Malawi, Mozambique, Rwanda, Somalia, South Sudan, Tanzania, Uganda and Zambia

Central sub-Saharan Africa: Angola, Central African Republic, Congo (Brazzaville), Democratic Republic of the Congo, Equatorial Guinea, and Gabon

Tropical Latin America: Brazil and Paraguay

Andean Latin America: Bolivia, Ecuador, and Peru

Central Latin America: Colombia, Costa Rica, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, Panama, and Venezuela

Caribbean: Antigua and Barbuda, The Bahamas, Barbados, Belize, Bermuda, Cuba, Dominica Dominican Republic, Grenada, Guyana, Haiti, Jamaica, Puerto Rico, Saint Lucia, Saint Vincent and the Grenadines, Suriname, Trinidad and Tobago, and Virgin Islands

Western Europe: Andorra, Austria, Belgium, Cyprus, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Israel, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, and UK

Southern Latin America: Argentina, Chile, and Uruguay

North America: Canada, Greenland, and USA

Asia Pacific: Brunei, Japan, Singapore, and South Korea

Australasia: Australia and New Zealand

5.2 Findings on Global Clinico-epidemiology and Prevalence of Scabies Globally:

As mentioned earlier, we reviewed 44 literatures over the 22 years from 2000 through 2022, here, we tried to describe findings of following published manuscripts extrapolated from randomly picked 28 scientific articles published in several medical journals, worldwide (Vide: 'Literature Matrix')[12]

In a recent publication 'Estimating global burden of scabies: what else do we need?', Cox V., revealed a need for more widespread implementation and funding of much needed control programs to reduce global impact of scabies.[3] However, estimating prevalence, complication, and management of scabies in developing world- R.J. Hay concluded that the recurrent problems of scabies are that, in many parts of the world, there is a close association between human louse infestations and scabies, and control of both may be linked with ivermectin.[13]

In Bangladesh, Karim, et al described in their community based survey in 2011 to study the socio-demographic characteristics of children infested with community acquired scabies in densely populated residential Madrasahs in and around Dhaka, when they concluded immediate attention to be given among Madrasah children in developing sustainable long-term intervention programs to combat scabies hyperendemicity (silent epidemics) to save thousands of those children from impending serious complications.[7]

However, few years later K. Talukder[14] in his article 'Controlling scabies in Madrasahs (Islamic religious schools) in Bangladesh', revealed a prevalence of scabies came down from 61% to 10% after mass scabies treatment, due to significant improvements in personal hygiene practices at the interventional areas (Madrasahs surveyed).

Again, Moniruzzaman Khan[15] et al revealed that management of scabies infection among outdoor patients in BIRDEM General Hospital, Dhaka, being more common in over-crowded conditions and reported to affect any individual irrespective of social status, personal hygiene, profession, gender, age or ethnicity. But they reported that classical scabies in Bangladesh remains moderate.

Clinical profile and Quality of Life (QoL) in scabies patients- as reviewed by Abu Baker r (in Enam Medical College and Hospital, Savar, Dhaka) yielded that scabies moderately affected the QoL of patients feeling sort of embarrassment and so, socially got isolated due to stigma/shame associated with scabies.[16]

A original research by H Feldmeier's conducted a study in an impoverished community in rural Brazil in 2009. They reported that presence and severity of disease were associated with poor living conditions and illiteracy, and that scabies remained an important health problem characterized by continuous transmission and the parasitic infestation was embedded in a complex web of causation characterized by poor living conditions and a low level of education.[17]

Luis Shimose from USA (2013) reported in a that diagnosis, prevention and treatment of Scabies, by should be made to develop a standardized, reliable and cheap method for the diagnosis of scabies that can be affordable to underdeveloped countries, where most of cases of scabies are reported from.[18]

Another such review from Australia by Daniel Engelman[19] in 2019 reported that control of scabies revealed that scabies disproportionately affects disadvantaged populations and causes considerable morbidity leading to severe bacterial infection and immune-mediated disease. So, to develop a global control program, key operational research questions must be addressed. Earlier, in 2015, a study in Canada stated that: by considering underlying risk factors, viz., poverty, overcrowding and lack of access to clean water, improving access to health care, should reduce burden of scabies among indigenous communities.[20]

Original research by Feng-Zeng Li[21] in 2020, Diagnostic Accuracy of Ceroscopy for Scabies, suggests that Dermot Image System may significantly increase accuracy of diagnosing scabies owing to its sensitivity and specificity. DIS may also help monitoring clinical responses to anti-parasitic treatment and detecting the recurrence or reinfection of scabies.[21] Whereas, recently, in 2021, Russell T[22] revealed on how to manage pediatric scabies being a NTD having serious population health risks. However, D. Engelman[4] in his article, titled '2020 Intern Alliance for the Control of Scabies Consensus for the Diagnosis of Scabies', appealed for a global attempt to develop a pragmatic, yet robust set of diagnostic features should be made- the criteria which will provide greater consistency and standardization for scabies diagnosis in field and clinical settings.[4]

In a review article titled Treatment, prevention and public health management of impetigo, scabies, crusted scabies and fungal skin infections in endemic populations: a systematic review from Australia, 2019, Philippa J. May[23] suggests that the recommendations for skin infections in high-burden contexts also highlight the need for further rigorous, experimental studies to fill the evidence gaps. Pragmatic, practical, high-quality, well-funded RCTs are essential in the settings where the findings will have external validity if meaningful progress is to be made towards reducing the gap in skin health outcomes between the rich and poor.

The findings of an original study on outbreak of scabies among preschool children, Accra, Ghana, 2017, BB Kaburi[24] reported that scabies outbreak with a propagated source occurred in preschool children. It was controlled by mass treatment with benzyl benzoate and health education. Classrooms and sleeping mats were disinfected, the decongestion of classrooms and discouraged sharing of sleeping mats. We had similar observation in our study among the children of some residential institution in and around Dhaka, Bangladesh as well.[7]

Back in 2005, Dr Rod J Hay, [11] in a review in WHO (titled Epidemiology and management of common skin diseases in children in developing countries) suggests that considering prevention of the skin diseases in children, basic recommendations for improving hygiene would probably benefit certain disorders. However, this raises the question of feasibility and cost-effectiveness of associated measures which seem necessary to obtain a significant impact. This was what we also reported in 2007 in an original article published in Pub Health (from Royal Soc, of Pub Health, London).[7]

An original research of Bart J Currie[25] in 2001, Australia, titled Skin infections and infestations in Aboriginal communities in northern Australia suggests that the sustainable and long-term improvements in scabies, skin sores and GAS-related disease require fundamental changes that address social and economic inequities and, in particular, living conditions.

A 2001 research article of Francesco Lacarrubba[26] from Italy, A New Noninvasive Diagnostic Tool for Scabies in Children, showed that HM video dermatoscopy is rapid, effective, and sensitive, and its most important advantage in children is its high compliance rate, and that it does not cause pain or physical or psychological discomfort.

In USA Laura Edison[27] studied scabies and bacterial super infection in 2015, among American Samoan children and commented that bacterial super infection prevalence and frequent re-infestation high light importance of diagnosing scabies and early treatment of both patients and close contacts. Investigating why certain Am Samoan counties have a lower scabies incidence might help guide recommendations for improving scabies control among counties with a higher incidence.

In Germany, a study from 2012 conducted an investigation of scabies outbreak in a kindergarten with a particular pedagogical concept, since exposure patterns were rather similar in all children of

kindergarten, and was impossible to disentangle whether transmission predominantly occurred through intimate body contact, via fomites, or through both forms.[28] In a review from Australia, in 2004, titled, Scabies: New future for a neglected disease, Shelley F. Walton[29] found that the control of this disease is hindered by diflculties with diagnosis, treatment cost, evidence for emerging resistance and lack of effective vaccine. So a vast range of research is necessary for the early diagnosis of the disease, novel forms of chemotherapy, vaccine development and new treatment possibilities for this important but neglected parasite.

In an epidemiology and morbidity study on scabies and pediculosis capitis in resource-poor community in Brazil by Heukelbach[30] in 2005, revealed the 1st community-based study on the epidemiology and morbidity of scabies and head lice infestation which described that pediculosis capitis and scabies are hyper endemic in the study areas and are associated with considerable morbidity There is an urgent need to develop control measures for these parasitic skin diseases in resource-poor communities.

In a research article titled Transmission of scabies in rural community in Brazil, 2007, Anne Jackson's[31] study outcome shows that the rural communities in many developing countries where scabies is endemic, we suggest that in these settings sexual transmission of scabies plays only a negligible role and that control measures should focus on children and females.

In a review article titled High Burden of Impetigo and Scabies in a Tropical Country in Australia, 2009, Andrew C. Steer [32] revealed that the impetigo and scabies disease burden in children in Fiji has been underestimated and possibly other tropical developing countries in the Pacific. These diseases are more than benign nuisance diseases and consideration needs to be given to expanded public health initiatives to improve their control.

Again, in an original article titled Validation of an Integrated Management of childhood Illness algorithm for managing common skin conditions in Fiji, 2009, Andrew C Steer[33] showed that the IMCI skin algorithm is a robust tool that should be incorporated into the IMCI after some modifications relating to scabies and impetigo and the use of this algorithm will help reduce the burden of skin diseases in children in Fiji through improved case identification and management.

In an outbreak investigation study titled Scabies Outbreak in an Intensive Care Unit with 1,659 Exposed Individuals-Key for controlling the outbreak, Manuela Buehlmann[34] showed that the crusted scabies resulted in high attack rates among Jews and household contacts. Timely institution of hygienic precautions with close monitoring and widespread, simultaneous scarified treatment of all exposed individuals are essential.

In a review article titled Retrospective analysis of institutional scabies outbreaks from 1984 to 2013: lessons learned and moving forward, by K. E. Mounsey[35], it was found that the impact of institutional outbreaks, the burden in terms of attack rates, economic costs, treatment trends, the types of index cases and outbreak progression.

In review article titled Scabies in healthcare settings in France, 2010, Bouvresse, Sophie [36] it was shown that the inclusion of institutionalized patients in randomized controlled trials would be beneficial as present data concerning scarified effectiveness are obtained from trials that recruited individual participants and do not take into account a global strategy.

5.3 Scabies: Clinical manifestation:

US CDC and Prevention of Global Health Division of Parasitic Dis and Malaria reported on biology of scabies that, after starting successful treatment, scabies itchiness and rashes generally gets improved within a few days and normally it clears up completely within a month or sos.[38] However, post-treatment persistent rash may sometimes persist in few cases- which may be the out due to following reasons:[37]

- Misdiagnosis, incorrect treatment, resistance issues, re-infestation from untreated contacts that leads to persistent infestation (vital issue to prevent / control)
- The hyper sensitivity reaction can be slow to settle, despite complete cure of parasitic infestation.
- On-going dermatitis occurs due to mite, scratching, irritation of topical treatment or other factors.
- Persistently itchy papules, nodules and eczematous plaques should be treated with frequent application of emollients and mild topical corticosteroids.
- Under-diagnosis/incorrect diagnosis is a major issue.

Figure-3, below, demonstrates various skin lessons of scabies (Engelman D).[4]

Fig. 3

Engelman D from Melbourne, Australian described the following findings of skin examination:[4]

[(a) Papules over the fingers, finger web spaces and back of hand of an adult.

(b) Papules and vesicles with excoriation on the volar wrist of a child.

(c) Papules, vesicles and pustules with excoriations over the palm and fingers of an infant.

(d) Widespread scabies rash in an infant. Larger nodules are seen on the torso, axilla and shoulder.

(e) Papules over the toes, feet and ankle of an infant.

(f)) Ulcer, pustule/crust represents impetiginized (secondary bact. infection) of scabies lesions on child's legs

(g) Papules and nodules on the scrotum and penis. Lesions are also seen on the groin and inner thighs. (h) Crusted scabies with thick, yellowish scale of the right hand.

***Engelman D**. '2020 International alliance for the control of scabies consensus criteria for diagnosis'.*[4]

5.4 Scabies: Bangladeshi context:

Bangladesh with an area of ~148,460 kilo-meter[38], which is one of the world's most densely populate country (1286 people/km^2) with 150 million residents.[38] In countries similar to Bangladesh where scabies remains a major public health problem. The most common inter human ectoparasite infection that causes scabies is *Sarcoptes scabies* var hominis. Besides geographical topography, environmental pollution and water sanitation are also play vital roles behind this skin disease. It is presented as generalized intractable intense pruritus mainly at night creating discomfort and nuisance. Although scabies has low morbidity it may result in serious consequence such as glomerulo-nephritis, when it occurs together with bacterial infection.

Figure 4 Map of Dhaka district and outskirts showing locations of all six madrashas surveyed. The six madrashas surveyed were: (1) Uttara; (2) Badda; (3) Agargaon; (4) Bashabo; (5) Lalbagh; and (6) Araihazari.

The first study of scabies, conducted in 2007 by Karim and Selim, et al., [1,7] described sociodemographic traits of children infested with scabies in densely populated communities of residential Madrasahs (Islamic Education Institute), findings showing that the mean age of the 492 children was 1.24±2.4 years. [7]

More than half (n=248, 50.4%) were aged 12–14.9 years, and 244 (49.6%) children were aged <12 years. Most of the children (n=455, 92.5%) were male and 13% had lost at least one parent (10% were orphans, 14% had no father and 15% had no mother). [7]

The report on institutional scabies in Bangladeshi Islamic Madrasahs found that many children were bedridden and had diflculty sleeping due to lack of education. The majorities of parents were illiterate or had an elementary education, and the majority worked as day laborers, rickshaw pullers, or home helpers.

Furthermore, 10.2% of the mothers had surplus income, 42.5% was financially stable, and 47.3% were insolvent.

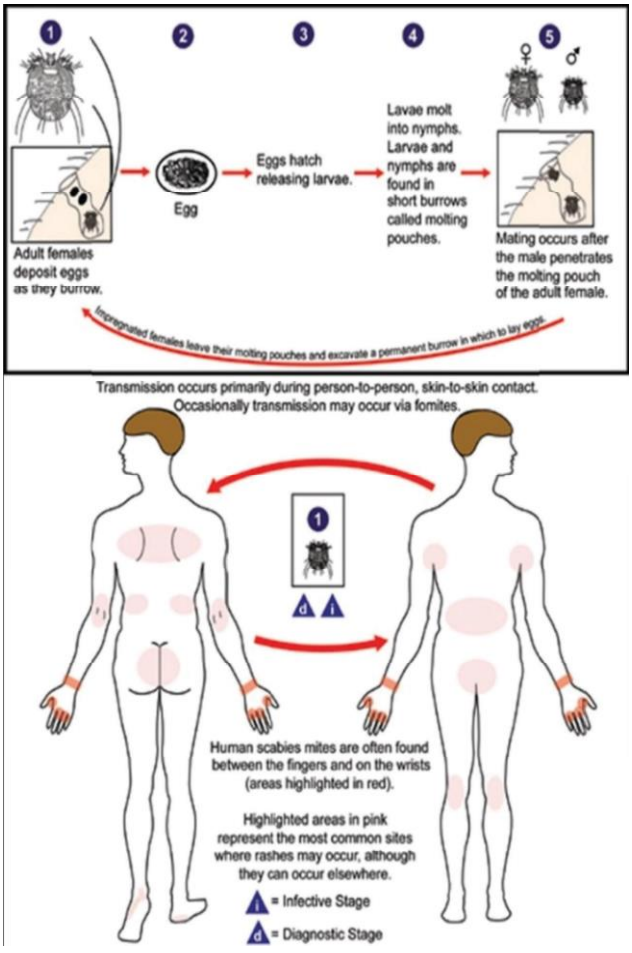

Figure-5: *Scabies transmission*[4]

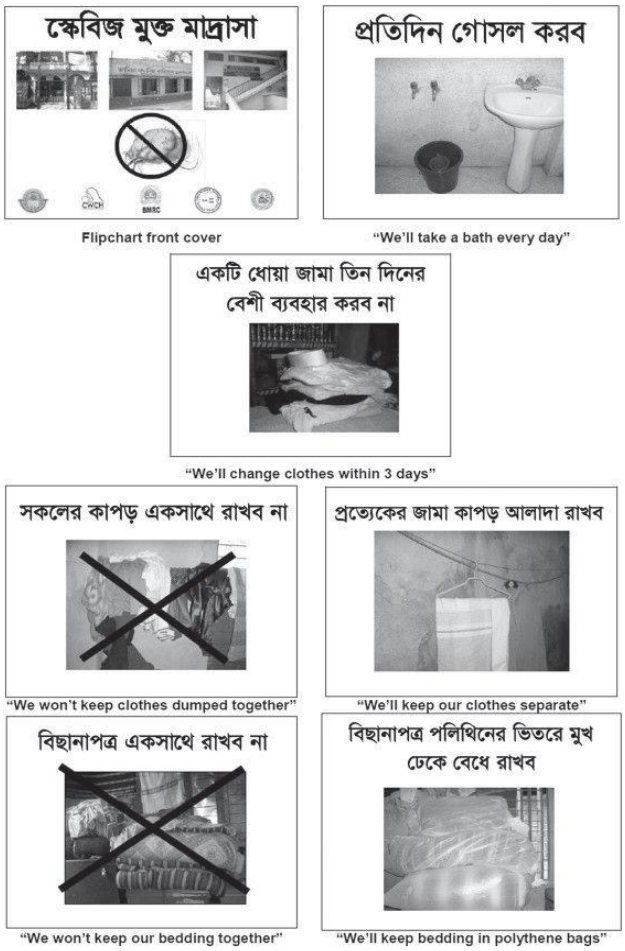

Figure-6: *Scenario of Madrasah for preventing scabies*[7]

Around 70% of children used tap water and 30% used tube or piped water for bathing and washing, 60% of them washed their clothes and bed sheets two to three times a fortnight, 36% did so in every 3-4 days, and ~90% slept on in floor on Patti (Thin Floor Mat) in close contact with each other.

The sleeping habits of those living so close together showed a substantial correlation with the severity of the illness and re-infection. [7]

Alike some of other reports on drug therapy [6, 15] findings of our study [7] on insuflcient drug use resulted in re-imposedion, and over 85% of people were found to be successfully treated for scabies mites with benzyl Benzoate lotion, Monosulfirum cream, or Permsethrin cream. Oral ivermectin may occasionally be used in severe instances, as children are always at danger for scabs due to severe financial constraints and illiteracy. [7]

6. DISCUSSION:

Though Fuller LC in 2013 opined that globally, scabies has a low morbidity rate[39] but we found it in higher proportion among the children of institutional settings like Madrasah back in 2007.[7] However, Scabies may result in serious consequences like glomerulonephritis, when it occurs together with bacterial infection,[39] which we also found it similarly but less frequently among our children in residential Madrasahs of densely populated Dhaka city and its outskirts[7] which Fölster-

Holst R et al[40] also attested even 9 years (in 2016) after our publication[7] as the most common inter human ectoparasite infection caused by *Sarcoptes scabiei* var hominis.[40]

On human epidermis, Scabies mites are often colonized and transmitted from person to person via skin-to-skin contact[41] particularly in overcrowded setting. It generally presents as intractable intense pruritus flaring up mainly during night creating huge discomfort and big nuisance[41,42] as we have also observed in a survey among the children living in some residential institutional.[7]

Most important risk factors of this contagious disease and its frequent transmission that includes: overcrowded living in households/room together with other families, poverty and lower parental educational attainment, sharing of personal belongings (bed sheets, bed linen, floor mat, poor bathing, poor personal hygiene, low socio-economic status, and so on.[7, 43]

Scabies reportedly remains more among younger children and among those who hardly maintain proper hygienic practices particularly in overcrowded households or various institutional settings like kindergarten, nurseries, day care, .[31] and, Madrasahs where we conducted an institutional survey in an around Dhaka back in 2007.[7]

Scabies infection is not completely dependable on educational status but need consciousness that stop hygienic practice and avoid over crowded place.[31] Health education should be included in educational curriculum and patients especially mothers and teachers should be educated in the light of health education, that the peoples can be introduced to the self-care system for themselves from the childhood.

Health education through the mass media should be provided in simple, easily understandable way regarding the cause and preventive measures of scabies infection.[44] School health should be introduced for practical application of hygienic practice. In this study it can be seen that, the lack of treatment protocol, miss diagnosis, inadequate treatment, financial insuflciency are also the vital reasons behind the re-infection of this disease.

It can be mentioned that patients of scabies follow doctor advice perfectly when they are treated. Such as they must avoid body contact until they and their partners and close contact have been treated. Partner and close contact should be treated simultaneously. These are the essential precautions in scabies reinfection.

Clinicians and drug companies recommended treatment of family members and close contacts at the same time as cases, to improve cure rates and reduce reinfection.[45] It is concluded that scabies infection is more prevalent in winter than summer. Prevention is dependent on principles common to most infectious diseases, that is, limitation of contact with the mite.

In Bangladesh there are numerous medical treatments available for scabies. But most effective Benzyl Benzoate lotion, Monosulfirum cream or Permethrin cream was found to be effective for the eradication of scabies mites approximately 85% of children, alike our findings.[7] Sometimes in severe cases oral ivermectin can be given to reduce the disease severity.[15]

7.1 Highlights:

- Scabies, an ancient disease of poor communities flaring up as a global burden.[3, 9, 10]
- Most research on scabies is conducted in urban, when rural people suffer more.[4, 13]
- Most focus on prevalence/clinical issues,[4] so, epidemiological and socio-economic data lacks
- Estimating global burden of scabies, Cox V, Fuller LC, et al commented that more widespread implementation and funding for much needed control programs are essential towards reducing global impact of scabies.[3]
- Estimating the prevalence, complications, and management of scabies in developing world- R.J. Hay[13] concluded that the recurrent problems of scabies are a close association between scabies and human louse infestations though the control of both are linked with ivermectin.

- Generation of scabies data remain important to derived from crowded communities, displaced refugees, crowded residential institutions in order to address scabies outbreaks which may occur anytime if unidentified/untreated scabies are not addressed, properly.[10]

7.2 Bottom-line:

- High proportion of <12 years-old children are infested with scabies in Bangladesh
- This contagious skin disease is more common among overcrowded population in particular.
- Scabies is associated with intense generalized pruritus/rash, itching/scratching more in winter.
- Household poverty, poor personal and environmental hygiene, unhygienic water sanitation, low socio-economic status, overcrowded population, sharing habit of personal belongings such as- apparels, bed linen, towel and so on are the main causes of disease transmission.
- Treating with Benzyl Benzoate lotion, Monosulfirum cream, Permethrin cream and oral ivermectin for severe cases have reportedly been effective.
- However, proper prevention and control depends on the eradication of scabies mites in 90% of children.
- Poorer community's children remain at constant yet greater risk of contracting scabies due to gross financial constraints and ignorance on scabies transmission and proper public health education- remains a burning issue to be endure at no time lost!

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Annexure-1: Literature Matrix *(based on randomly selected 28 studies, only)*

Matrix of childhood scabies				
Sl. No	Country, Year, Author	Title of Article	Article Type	Major Findings
1.	Global, 2020, V.Cox[3]	Estimating the global burden of scabies: what else do we need?	Review article	The case for more widespread implementation and funding of much needed control programs to reduce the global impact of scabies.
2.	Bangladesh, 2013, K. Talukder[14]	Controlling scabies in madrasahs (Islamic religious schools) in Bangladesh	Original research article	Before the intervention, the prevalence of scabies was 61% and 62% but after mass scabies treatment, the prevalence reducing to 5% and 50% in intervention and control madrasahs, There were significant improvements in personal hygiene practices at the intervention madrasahs.
3.	Bangladesh, 2020, M. Moniruzzaman Khan[15]	The management of Scabies infection among the outdoor Patients of BIRDEM General hospital, Dhaka, Bangladesh"	Original research article	Scabies is more common where overcrowded conditions prevail; it can affect any individual irrespective of social status, personal hygiene, profession, gender, age or ethnic origin and Classical scabies is more active in Bangladesh as a moderate form.
4.	UK, 2012, R.J. Hay[13]	Scabies in the developing world-its prevalence, complications, and management.	Review article	The recurrent problems of this disease are that, in many parts of the world, there is a close association between human louse infestations and scabies, and control of both may be linked with ivermectin.
5.	Bangladesh, 2007, K S Anwar[7]	Socio-demographic characteristics of children infested with community acquired scabies in densely populated residential institutions in Dhaka, Bangladesh.	Pediatric research	These findings demands immediate attention to developing sustainable long-term intervention programs to combat scabies hyperendemicity (silent epidemics) to save thousands of children from impending serious complications.
6.	Bangladesh, 2022, Md. Abu Baker [16]	Clinical Profile and Quality Of Life in Scabies Patients-A Study In Enam Medical College And Hospital, Savar, Dhaka, Bangladesh.	Reviewed Journal	Scabies moderately affected the quality of life of the patients in the present study in the form of feeling of embarrassment and social isolation due to stigmata and shame associated with this disease. All these findings were more frequently observed among adult patients as compared to children.
7.	Brazil, 2009, Hermann Feldmeier [17]	In an impoverished community in rural Brazil: Presence and severity of disease are associated with poor living conditions and illiteracy	Original research article	Findings show that the impoverished community scabies is an important health problem characterized by continuous transmission throughout the year. The parasitic skin disease is embedded in a complex web of causation characterized by poor living conditions and a low level of education.
8.	USA, 2013, Luis Shimose[18]	Diagnosis, Prevention, and Treatment of Scabies.	Review article	Efforts should be made to develop a standardized, reliable, and cheap method for the diagnosis of scabies that can be affordable to underdeveloped countries, where most of cases of scabies are seen.
9.	Australia, 2019, Daniel Engelman[19]	The public health control of scabies: priorities for research and action.	Review article	Scabies disproportionately affects disadvantaged populations and causes considerable morbidity and leads to severe bacterial infection and immune-mediated disease. So, to develop a global control program, key operational research questions must be addressed.
10.	Canada, 2015, Anna Banerji[20]	Scabies	Journal article	Considering the underlying risk factors, such as poverty, overcrowding and lack of access to clean water, while improving access to health care, should help to reduce the burden of this disease in Indigenous communities.
11.	Korean, 2020, Feng-Zeng Li[21]	Diagnostic Accuracy of Ceroscopy for Scabies	Original research	The study suggests that DS (Dermat Image System) may significantly increase the accuracy of diagnosing scabies owing to its sensitivity and specificity. DS may also help in monitoring the clinical responses to anti-parasitic treatment and detecting the recurrence or reinfection of scabies.

12.	Australia,2021,Russell Thompson[22]	Pediatrics: how to manage scabies		Scabies as a neglected tropical disease with serious population health risks, often in areas of great health need, improved community control strategy, research into emerging and repurposed topical and systemic treatments and evidence-based rigorous
13.	Australia, 2020, D.Engelman[4]	The 2020 Intern Alliance for the Control of Scabies Consensus for the Diagnosis of Scabies	Journal article	A global attempt to develop a pragmatic, yet robust set of diagnostic features. It is hoped these criteria will provide greater consistency and standardization for scabies diagnosis in field and clinical settings.
14.	Australia, 2019, Philippa J. May[23]	Treatment, prevention and public health management of impetigo, scabies, crusted scabies and fungal skin infections in endemic populations: a systematic review	Review article	The recommendations for skin infections in high-burden contexts also highlight the need for further rigorous, experimental studies to fill the evidence gaps. Pragmatic, practical, high-quality, well-funded RCTs are essential in the settings where the findings will have external validity if meaningful progress is to be made towards reducing the gap in skin health outcomes between the rich and poor.
15.	Ghana, 2019, Basil Benduri Kaburi[24]	Outbreak of scabies among preschool children, Accra, Ghana, 2017	Original research	The findings show that, scabies outbreak with a propagated source occurred among preschool children. It was controlled by mass treatment with benzyl benzoate and health education. Classrooms and sleeping mats were disinfected, the decongestion of classrooms and discouraged sharing of sleeping mats.
16.	WHO,2005 Dr Rod J Hay[25]	Epidemiology and management of common skin diseases in children in developing countries	Review article	Considering prevention of the skin diseases in children, basic recommendations for improving hygiene would probably benefit certain disorders. However, this raises the question of the feasibility and cost-effectiveness of associated measures which seem necessary to obtain a significant impact.
17.	Australia, 2001, Bart J Currie[26]	Skin infections and infestations in Aboriginal communities in northern Australia	Original research	Sustainable and long-term improvements in scabies, skin sores and GAS-related disease require fundamental changes that address social and economic inequities and, in particular, living conditions.
18.	Italy,2001, Francesco Lacarrubba[27]	A New Noninvasive Diagnostic Tool for Scabies in Children	Research article	HM video dermatoscopy is rapid, effective, and sensitive, most important advantage in children is its high compliance rate, does not cause pain or physical or psychological discomfort.
19.	USA,2015, Laura Edison[28]	Scabies and Bacterial Super infection among American Samoan Children	Review article	Bacterial super infection prevalence and frequent re-infestations highlight the importance of diagnosing scabies and early treatment of patients and close contacts. Investigating why certain AS counties have a lower scabies incidence might help guide recommendations for improving scabies control among counties with a higher incidence.
20.	Germany,2012, Ari Wales[29]	Investigation of a scabies outbreak in a kindergarten in Constance, Germany	Research article	Outbreak of scabies in a kindergarten with a particular pedagogical concept. Since exposure patterns were rather similar in all children of the kindergarten, it was impossible to disentangle whether transmission predominantly occurred through intimate body contact, via fomites, or in both forms.
21.	Australia, 2004, Shelley F. Walton[30]	Scabies: New future for a neglected disease	Review article	The control of this disease is hindered by diflculties with diagnosis, treatment cost, evidence for emerging resistance and lack of effective vaccine. So vast range of research is necessary for the early diagnosis of the disease, novel forms of chemotherapy, vaccine development and new treatment possibilities for this important but neglected parasite.

22.	Brazil, 2005, J. Heukelbach[31]	Epidemiology and morbidity of scabies and pediculosis capitis in resource-poor communities in Brazil	Original Research	The first community-based study describing in detail the epidemiology and morbidity of scabies and head lice infestation in Brazil which descried that pediculosis capitis and scabies are hyper endemic in the study areas and are associated with considerable morbidity The urgent need is to develop control measure for the parasitic skin disease in resource-poor communities.
23.	Brazil, 2007, Anne Jackson[32]	Transmission of scabies in a rural community	Research article	Study outcome shows that rural communities in many developing countries where scabies is endemic, we suggest that in these settings sexual transmission of scabies plays only a negligible role and that control measures should focus on children and the female se
24.	Australia, 2009, Andrew C. Steer [33]	High Burden of Impetigo and Scabies in a Tropical Country	Review article	The impetigo and scabies disease burden in children in Fiji has been underestimated and possibly other tropical developing countries in the Pacific. These diseases are more than benign nuisance diseases and consideration needs to be given to expanded public health initiatives to improve their control.
25.	Fiji, 2009, Andrew C Steer[34]	Validation of an Integrated Management of Childhood Illness algorithm for managing common skin conditions in Fiji	Original article	The IMCI skin algorithm is a robust tool that should be incorporated into the IMCI after some modifications relating to scabies and impetigo and the use of this algorithm will help reduce the burden of skin diseases in children in Fiji through improved case identification and management.
26.	Switzerland, 2015, Manuela Buehlmann[35]	Scabies Outbreak in an ICU with 1,659 Exposed Individuals-Key for controlling the outbreak.	Outbreak investigation study	Crusted scabies resulted in high attack rates among hews and household contacts. Timely institution of hygienic precautions with close monitoring and widespread, simultaneous scarified treatment of all exposed individuals are essential.
27.	Australia, 2016, K. E. Mounsey[36]	Retrospective analysis of institutional scabies outbreaks from 1984 to 2013: lessons learned and moving forward.	Review Article	The impact of institutional outbreaks, the burden in terms of attack rates, economic costs, treatment trends, the types of index cases and outbreak progression.
28.	France, 2010, Bouvresse, Sophie [37]	Scabies in healthcare settings	Review Article	Inclusion of institutionalized patients in randomized controlled trials would be beneficial as present data concerning scarified effectiveness are obtained from trials that recruited individual participants and do not take into account a global Strategy.