Epidemiology of molluscum contagiosum in children: a systematic review

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Abstract

Background. Molluscum contagiosum (MC) is a common skin condition that primarily affects children, a common reason for presenting in primary care and is commonly seen in children presenting with other conditions in primary and secondary care. It is usually asymptomatic but can present with pain, pruritus, erythema and bacterial superinfection.

Aim. To synthesize the current epidemiology of MC.

Design and setting. A systematic literature review of bibliographical databases on the prevalence, incidence, risk factors, age distribution and association with other conditions for MC in children.

Results. Data on the epidemiology of MC is largely of poor quality. The largest incidence is in children aged between 0 and 14 years, where the incidence rate ranged from 12 to 14 episodes per 1000 children per year. Incidence rates in the UK were highest in those aged 1–4 years. Meta-analysis suggests a point prevalence in children aged 0–16 years of between 5.1% and 11.5%. There is evidence for an association between swimming and having MC and MC is more common in those with eczema; however, there is little evidence for other risk factors.

Conclusions. MC is a common condition, with the greatest incidence being in those aged 1–4 years. Swimming and eczema are associated with the presence of MC and MC is more common in those with eczema; however, there is little evidence for other risk factors.

Key words: Common illnesses, dermatology, epidemiology, pediatrics, primary care, quality of life.

Introduction

Molluscum contagiosum (MC) is a common skin condition, caused by a member of the poxvirus family (1,2), that causes considerable parental anxiety and results in primary and secondary care consultations. It is common in children and generally presents with asymptomatic lesions; however, it can present with pruritus, erythema and, on some occasions, bacterial superinfections with inflammation and pain (3,4). Dermatological conditions can impact upon quality of life; in severe cases, they can have similar impacts to that of chronic conditions (5). The reported incidence and prevalence of MC varies widely, therefore it is difficult to estimate the true number affected by MC. Evidence of factors increasing the risk of transmission is mixed. In children, there are few treatment options available for clearing of MC lesions. Treatments such as curettage are particularly unpleasant and often lead to pain and scarring (1,3). A Cochrane Review of treatment for cutaneous MC in 2010 recommended...
MC to be left to heal naturally until better evidence for superiority of other treatment options emerge (6). Most patients who visit the doctor wish to leave the consultation with a prescription (7), thus parents may be uncomfortable without being prescribed a treatment following their child’s MC diagnosis. In these instances, it is important that clinicians have accurate information available about the prognosis and management of MC.

There is a paucity of carefully synthesized data on the epidemiology of MC. Therefore, we set about to address this gap by conducting a systematic literature review on the prevalence, incidence, risk factors, natural history, age distribution and association with other conditions for MC in children.

Methods

Data sources

We conducted a systematic search of bibliographical databases using a predefined search strategy in October 2012. Articles were also identified from reviews of citations within articles, a preliminary scoping exercise using ‘Google Scholar’, and identification of articles by experts in the field.

Medical subject headings were used in Ovid® to search the Medline (1946 to October 2012), Embase (1947 to October 2012) and Cochrane databases. Duplicates were removed and the search was restricted to English language and studies involving humans.

Data extraction and analysis

All publications identified in the search were screened by title and abstract using the inclusion criteria below. The full texts of all articles that might have been potentially relevant were requested for full review by one author (JO) using a template covering key study characteristics, incidence and prevalence of MC, age distribution, risk factors and other conditions associated with MC.

Inclusion and exclusion criteria

Articles were included if they were original research articles on the incidence, prevalence, risk factors, age distribution or other conditions associated with MC in children. We excluded studies if they were nonoriginal research, review papers, singular case reports, treatment trials or related exclusively to adults, immunocompromised individuals, those attending sexual health clinics or dental MC. We included studies if they related to both children and adults and, where possible, extracted only the data that pertained to children.

Results

Our search identified 441 articles. After reviewing the abstracts of all 441 articles, 25 publications met our inclusion criteria (Fig. 1). Data, where available, was extracted for analysis.

Incidence of primary health-care consultations for MC

All studies on the incidence of MC used routinely collected data. We found two studies that explore the incidence of MC in England and Wales (8,9) using routinely collected data from the same sentinel practice network (Weekly Returns of the Royal College of General Practitioners), representing a population of 950000; the first study collected data over a 10 year period (1994–2003), and the most recent over a single year (2006). Both studies found similar incidence rates, the greatest incidence being in those aged 1–4 years (15.0–17.2 per 1000; Table 1). There was little variation in incidence rates between genders.

A study of North American Indians that involved extracting routinely collected data over a 5-year period (2001–05) about patients attending outpatient departments found an annual incidence rate of 2.01 per 1000 (11). The peak incidence was in the 1- to 4-year age group (10.2 per 1000), and 5 to 14 year olds had a higher than average incidence rate (4.04 per 1000).

The largest incidence of MC was reported in Holland (25 per 1000) where data were extracted for a period of 12 months (1987–88) from 10 general practices of routinely collected data with a total study population of 332200 (10). However, this rate was calculated for only those aged 10 years. Regional differences in incidence rates were found in different regions of Holland, ranging from 1.0 to 3.2 per 1000. The author noted no differences in the climate, temperatures or urbanization between the areas, with very similar rates reported in each population size examined. Regional differences were also found in North America (11), where differences were consistent across all 5 years of study data examined and, again, there was no explanation that could attribute a higher incidence to a region.

Population prevalence

The prevalence of MC was described in eight articles (Table 2). No article reported the prevalence of MC in Western Europe or North America. Studies reporting the prevalence in children in a variety of settings in Israel, Romania, New Guinea, Mali, Japan and Turkey described a prevalence of MC ranging from 0.27% in 6 to 12 year olds in Romania (12) to 34% in 2–9 year olds in Israel (13).

The study population that is most similar to Western Europe and North America, in terms of economic development, is Japan, where two studies in children aged 4–11 and 0–6 years showed a point prevalence of 6.9% (15) and cumulative prevalence of 19.7% (19). Both were cross-sectional studies of children where parents were asked to recall a diagnosis of MC for their child.
Two studies reported a point prevalence that was considerably higher (34% and 22%) than that was found in other studies. The first of these was conducted in a small rural community in the warm and dry climatic area of the Jezreel Valley, Israel, following reports of a small epidemic in 1991 in 2–9 year olds (13). The other was a study of those aged 0–10 years in 16 villages in the West Sepik District of New Guinea, which was identified due to a larger number of cases of MC in the village (14). The lowest point prevalence reported was 0.27% in Romanian school children aged 6–12 years (12).
Meta-analysis of prevalence data gives an overall estimated weighted prevalence in children of 8.28% (95% CI 5.1–11.5); however, when the three studies with a considerably higher rate are excluded, due to potential outbreaks and a lifetime prevalence recorded, the estimated prevalence is lower 2.83% (95% CI 0.0–5.9; Fig. 2).

Gender

The was no evidence of a difference in prevalence by gender, with the proportion of males ranging from 41.2% to 62.0% and confidence intervals including 50% in most studies (Table 3).

Risk factors

Swimming

There is an association between a recent history of swimming and development of MC in children (Table 4). The risk of MC amongst swimmers is nearly twice [relative risk (RR) 2.3 CI 1.6–3.21] that of nonswimmers (20). Similarly, the risk in frequent swimmers is about twice as high (RR 2.0 CI 1.25–3.20) as the risk in those with low-frequency swimming pool use (15).

In Brisbane, all persons diagnosed with MC from primary and secondary care centres during a 5-month period were invited to undertake a dermatological assessment and interview about swimming pool use (n = 210, age 0–47 years) (21). The study

Table 2. Reported prevalence of MC (number of cases identified within study sample per 100)

<table>
<thead>
<tr>
<th>References</th>
<th>Location</th>
<th>Age group (years)</th>
<th>Population</th>
<th>Cases</th>
<th>Prevalence</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sturt et al. (14)</td>
<td>New Guinea</td>
<td>0–10</td>
<td>78</td>
<td>17</td>
<td>21.8</td>
<td>12.6–31.0</td>
</tr>
<tr>
<td>Niizeka et al. (15)</td>
<td>Japan</td>
<td>4–11</td>
<td>7472</td>
<td>517</td>
<td>6.9</td>
<td>6.3–7.5</td>
</tr>
<tr>
<td>Oren and Wende (13)</td>
<td>Israel</td>
<td>2–9</td>
<td>81</td>
<td>28</td>
<td>34.6</td>
<td>24.2–44.9</td>
</tr>
<tr>
<td>Mahe et al. (16)</td>
<td>Mali</td>
<td>0–12</td>
<td>1817</td>
<td>65</td>
<td>3.6</td>
<td>2.7–4.4</td>
</tr>
<tr>
<td>Popescu et al. (12)</td>
<td>Romania</td>
<td>6–12</td>
<td>1114</td>
<td>3</td>
<td>0.3</td>
<td>0–0.6</td>
</tr>
<tr>
<td>Tuncel and Erbagci (17)</td>
<td>Turkey</td>
<td>14–16</td>
<td>166</td>
<td>2</td>
<td>1.2</td>
<td>−0.5 to 2.9</td>
</tr>
<tr>
<td>Tabari and Shakerian (18)</td>
<td>Iran</td>
<td>1–5</td>
<td>986</td>
<td>21</td>
<td>2.1</td>
<td>1.2–3.0</td>
</tr>
<tr>
<td>Hayashida et al. (19)</td>
<td>Japan</td>
<td>0–6</td>
<td>913</td>
<td>180</td>
<td>19.7</td>
<td>17.1–22.3</td>
</tr>
</tbody>
</table>
found an association between having more severe MC (>26 lesions) and a range of swimming-pool-based activities, such as using a school swimming pool (RR 1.86 CI 1.79–3.37), sharing a bath sponge (RR 2.79 CI 1.69–5.43), and sharing a bath towel (RR 1.57 CI 1.33–3.67) with someone infected with MC.

Association with atopic dermatitis

Three studies suggest an association between atopic dermatitis (AD) and MC. A case–control study in Greece identified 110 children with MC and compared prevalence of AD in this group to the prevalence of AD in a previous national cross-sectional study. In the MC cohort, 18.2% (n = 20) had AD compared with just 5% in the national survey (22). In North America, the case notes of children attending paediatric outpatient clinics were prospectively reviewed (n = 302), and these showed a prevalence of AD in children with MC of 24% (24). In a similar study in France, the prevalence of AD was 43% (26).

A prospective observational study in a paediatric outpatient clinic in Brazil found no relationship between MC and the development of AD (28).

Transmission between family members

Only one study described the incidence of MC in family members of an index case. Eight children in North America were followed up for the duration of their lesions. Over an average of at least 10 months, the researchers identified two new cases in family members (29).

Duration of lesions

Very little data on the duration of lesions was found. Two small studies in Alaska (n = 13) and Fiji (n = 14) reported a duration that ranged from 2 weeks to 24 months (29). Only in Fiji, the mean duration was calculated as 8 months (30).

Quality of life

One small study (n = 30) examined the impact of MC on quality of life in children with MC and their parents. Parents were significantly more concerned about MC than their child, with 82% of parents (n = 23) stating ‘it concerned them moderately or greatly’, compared with 43% of children (23).

Discussion

Summary

The largest incidence of MC is in children aged between 0 and 14 years. Combining data from different studies, we found an overall incidence rate in children of 12–14 episodes per 1000 person years. Incidence rates in the UK were greatest in those aged 1–4 years, and there was little variation between genders.
(8,9). Current rates have not been explored to describe recent trends or to provide a detailed analysis of age groups within those aged 0–14 years.

We found an overall reported prevalence of MC in children of between 5.1% and 11.5%. Where gender of those attending specialist dermatologists were examined, there was little variation in numbers between males and females.

Strengths and limitations
This review has some limitations. The data collection methods used to capture a diagnosis of MC varied considerably in two studies in Japan; these may be overestimate of the point prevalence due to the self-reporting of a diagnosis. One study includes any previous diagnoses and relies upon accurate recall by parents (19), and the second did not report how a diagnosis of MC was obtained (15). Where a robust diagnostic method consisting of two independent dermatologist examinations was used, it only included children aged between 6 and 12 years and therefore did not include those at greatest risk [younger than 4 years (as shown in incidence section)]. The results of the meta-analysis may also be skewed by the three studies reporting a much higher prevalence of MC.

All studies on the incidence of MC used routinely collected data and this is subject to coding problems and under-ascertainment (2,4,31–38). Therefore, the true incidence of MC is likely to be considerably higher than that reported in these studies. This is supported by the reported prevalence, especially in studies that involved examinations, compared with the reported incidence. The difference between the incidence of MC reported in Western Europe and North America may be due to the different health-care systems in the two countries; the Western Europe studies recorded data where patients had visited a general practitioner, which is the first point of contact for all nonemergency patients. Data extracted in North America included only outpatient visits to a specialist physician, which were exclusive to the American Indian/Alaska Native population, and also are not representative of the North America population. The association between MC and AD is not well described, and comparisons between the two are limited. Where the number of children with AD in a cohort of MC cases were compared with that of a national survey (22), they did not allow a direct comparison due to the different age groups; the national survey examined children aged 1–6 years, whereas the cohort of children attending the dermatology clinics was aged between 8 months and 11.5 years.

Where swimming pool activities such as using a school swimming pool, the sharing of towels and bath sponges with someone infected with MC were shown to increase the risk of having a more aggressive infection of MC, the analysis included both adults and children (21). As the risk factors described would typically only be associated with school-aged children who are more at risk of developing MC, the results might have been skewed.

Comparison with existing literature
Swimming was firstly discussed by Wilson (1910) as an activity causing an increased opportunity for transmission of MC (39). Since 1910, the associations between swimming and a higher risk of MC development have been described frequently within the literature. Postlethwaite et al. (27), Niizeki et al. (15), Castilla et al. (20), and Choong and Roberts (21), all showed that swimming was common in those with MC. Where RR has been calculated, it shows that it is likely that swimming is a causal factor for development of MC.

Climate is often described as being a factor associated with a higher prevalence of MC (40–43), and similarly, the two highest rates found in our search were in hot climates. However, the first study was described as taking place during an epidemic and the second had large variation in prevalence between individual villages and therefore it can be questioned whether the results of either are representative of warm, dry areas. Indeed, studies from other warm and dry climates such as Mali (3.6%) (16), Turkey (1.2%) (17) and Iran (2.1%) (18) have reported considerably lower prevalence.

The typical duration of lesions described in literature ranges considerably from several months to 5 years (2,41,43,44). However, during our search, we only found two studies, of small sample size, to have followed up cases of MC to describe the duration of lesions. They ranged from 2 to 24 months and an average duration of 8 months.

Implications for practice and research
Data on the epidemiology of MC is of poor quality and this may be due, in part, to MC often being considered to be a trivial condition (2). Clinicians should advise parents that MC may be most common in the 1- to 4-year age group and that it is more common in children with eczema and who swim. There are little data on the natural history but the best available data suggest that lesions last anywhere from 2 months to 2 years.

Further research should better define the prevalence of MC by conducting community studies involving direct examination or by using parental diagnosis if this can be shown to be of sufficient accuracy. Larger prospective studies should explore the presentation, current management, transmission, impact on quality of life and natural history of MC.

Declaration
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Conflict of interest: none.
References