

# Occurrence of human urogenital myiasis due to neglected personal hygiene: a review

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Myiasis, the infestation of tissues or organs of vertebrate animals with dipteran larvae, is a common parasitic problem among domestic and wild mammals. The condition, which is also witnessed in humans, is relatively frequent in rural areas where people are in close contact with domestic animals. It is a subject of medical and veterinary importance, particularly in tropical and subtropical regions of the world. Human myiasis is generally encountered in open neglected wounds but can also affect body orifices with foetid discharge, such as the oral cavity, eyes, ears, anus and urogenital tract. Urogenital myiasis involves infestation of the urinary tract, as well as genital organs such as vaginal or penile orifices, with fly larvae. The condition is a rare among humans inhabiting developed countries but relatively more common in patients of low socio-economic status with poor hygienic conditions in developing countries. Damage varies from superficial to massive infestation, which may result in severe problems or even death of the individual. In the present study, the authors reviewed the past literature describing the cases of human urogenital myiasis, causative fly species and risk factors. The aim of the present article is to document the predisposing risk factors and provide guidelines for prevention and control of urogenital myiasis among humans. Besides poor genital hygienic conditions, other factors leading to urogenital myiasis include psychiatric disorders, the use of urinary catheters and uterine prolapse. Prevention of the condition is of utmost importance and involves the dressing and covering of open wounds, maintaining proper personal hygiene and control of fly populations.

**Keywords:** diptera, genital mutilation, maggots, urogenital myiasis

## Introduction

Animals are not only attacked by numerous adult insects but also by their larval stages. Such an invasion of human and animal tissues by the dipteran larvae (maggots) is known as 'fly strike' or myiasis. Myiasis is the parasitic infestation of tissues and organs of live vertebrate animals by maggots, which use the living or necrotic tissue of the host as a food source.<sup>1</sup> The phenomenon is usually observed in domestic animals and is a real problem of worldwide occurrence in animal-raising countries. It has been reported as one of the most common parasitic infestations among livestock animals throughout the tropical regions of the world.<sup>2,3</sup> Besides animals, the condition has also been reported among humans in developing countries.<sup>4</sup> Cases of human myiasis appear occasionally, but epidemics are very rare. Being a zoonotic disease, the presence of domestic and livestock animals in close proximity is a precondition for human infestation.

Myiasis is considered an embarrassing and repugnant disease to both patients and health care professionals. The prevalence of myiasis may be interrelated with poor hygiene, the density of

existing fly populations, living standards of the individual and levels of sanitation. Psychiatric, physically challenged and immunocompromised patients and neonates are especially vulnerable to infestation.<sup>5</sup> Fly larvae, commonly known as 'maggots', feed on the tissues, which cause the small initial wound to develop into a larger one, possibly damaging vital organs of the body, which may prove to be fatal for the host. Feeding and growing larvae may cause severe inflammation and excruciating pain, resulting in the disturbance of sleep. Under very rare circumstances, larvae may migrate from the external auditory meatus into the internal ear or brain (infiltrative myiasis), leading to deafness or death of the patient.<sup>1</sup> The developing larvae mostly confine their activities to necrotic tissue, but they may sometimes invade deeper healthy tissue. Hence the condition may initially be asymptomatic but may lead to serious health problems or death due to septicæmia.<sup>6</sup>

Reproductively mature female flies are attracted to malodorous discharge from neglected open wounds or from body orifices such as the eye, ear, nose, vagina, anus and urethra for egg laying. The eggs or larvae are deposited in or on the edges

of the wound. After hatching, the first instar larvae invade the ruptured skin and start feeding on the tissue for their development. When their development is complete, the fully grown third instar larvae leave the wound and fall off in the soil for pupation.<sup>1</sup>

Myiasis is broadly classified into three categories: (i) obligatory myiasis—maggots exclusively infest a live host, consuming living tissue (e.g. larvae of the families Oestridae [nasal bots], Hypodermatidae [warble flies] and Cuterbridae infest the dermal and subdermal tissues whereas larvae of the family Gasterophilidae [equid and rhino bots] develop in the alimentary canal of various animals, particularly horses); (ii) facultative myiasis—maggots are normally free-living in decaying organic matter (carrion, faeces, sewage etc.) but may occasionally infest living animals, initially and primarily consuming dead tissue, only sometimes attacking healthy living tissue after the former is exhausted (e.g. larvae of the families Calliphoridae, Sarcophagidae and Muscidae, which cause myiasis in cow, buffalo, sheep, wildlife, man etc.; larvae of the muscoid genus *Fannia*, which are sometimes found in the urogenital system of humans also belong to this group); and (iii) accidental or pseudomyiasis—maggots are accidentally ingested with food and cause intestinal problems by passing through the gastrointestinal tract alive.<sup>7</sup> Myiasis can also be divided into various types according to the tissue and region of the body infested.<sup>8</sup> (i) subdermal myiasis refers to maggots under the skin, (ii) oral myiasis is an infestation of the mouth, (iii) nasal myiasis is infestation of the nasal chambers, (iv) aural myiasis is an ear infestation, (v) ocular myiasis is maggots in the eye, (vi) enteric myiasis is an infestation of the intestine, (vii) rectal myiasis is an anal infestation and (viii) urogenital myiasis is an infestation of maggots in urethra, urinary bladder and genital organs.

## Urogenital myiasis

Urogenital myiasis involves infestation of the urinary tract as well as genital organs such as the vaginal or penile orifice with fly larvae. The condition is rare among humans with appropriate hygiene inhabiting developed countries. The infestation probably occurs by the deposition of eggs or larvae near the male or female genital organs to which female flies are attracted by foetid discharge (leucorrhoeal, gonorrhoeal, menstrual or seminal), pre-existing sores or a diseased condition such as carcinoma. The larvae then actively invade the urogenital tract and the surrounding tissue. Another possible method of invasion is through the use of a catheter, a syringe for douching or some other medical instrument that has been contaminated with urine or pus, which acts as an attractant to the ovipositing female flies. The details of cases of urogenital myiasis reported in the literature, along with the fly species responsible, are listed in Table 1. Urogenital myiasis can be broadly divided into two categories: urinary tract myiasis and genital myiasis.

## Urinary tract myiasis

Urinary tract myiasis is infestation of the urethra and the maggots generally appear in the urine of affected patients. It is associated with predisposing factors such as poor hygiene, limited mobility, urinary obstruction and ulcerative lesions. No true

cases of obligatory myiasis of the urinary tract are known, but cases of facultative myiasis occur from time to time. Those reported up to 1907 were critically summarized in the study by Chevrel<sup>9</sup> in which the larvae of four fly species (*Fannia canicularis* L., *Fannia scalaris* F., *Musca domestica* L. and *Sarcophaga carnaria* L.) were found to survive in the urinary bladder and the connecting cavities of humans. About 50% of the reported cases were due to *F. canicularis*, the larvae of which seem to be especially suitable for living in the conditions of the urinary tract. Other species recorded later by several authors include *Sarcophaga haemorrhoidalis* from Libya<sup>10</sup> and *Wohlfahrtia magnifica* Schin from Spain.<sup>11</sup> The larvae of *Calliphora* sp. were reported to be excreted in the urine of an elderly male patient.<sup>12</sup> *Anisopus fenestralis* Linnaeus larvae have been recorded from the urinary tract of female<sup>13</sup> and male<sup>14</sup> patients. Thompson et al.<sup>15</sup> recorded a larva of *Scenopinus* in the urine of a female in the USA. *Musca domestica* has been involved in cases of urogenital myiasis and a fascinating account is provided by Leon<sup>16</sup> in which a male student in Romania actually ejaculated maggots. The case of a 5-year-old female suffering from an abdominal contusion was reported from Japan. She excreted some fly larvae in her urine that were identified as *Megaselia scalaris*.<sup>17</sup> This fly has also been reported to be involved in cases of urinary myiasis in a 5-year-old female from Saudi Arabia,<sup>18</sup> a 60-year-old male Iranian patient,<sup>19</sup> a patient from The Netherlands<sup>20</sup> and a patient from India.<sup>21</sup> The larvae of Drain fly-*Telmatoscopus albipunctatus* have been reported to cause urinary myiasis in a 69-year-old female from Japan,<sup>22</sup> a male patient<sup>23</sup> and a 24-year-old female from Egypt.<sup>24</sup> An adolescent from Egypt, with recently removed ureteral stents and exposure to toilet water developed urinary tract myiasis due to larvae of *T. albipunctata*.<sup>25</sup> A case of urinary myiasis in a 58-year-old patient was reported from Scandinavia due to *Eristalis tenax*.<sup>26</sup> The larvae of *Eristalis* species (Diptera: Syrphidae) have been reported in the urine of a Malayan female<sup>27</sup> and a patient with ureteric obstruction from Israel.<sup>28</sup> Three cases of human urinary tract myiasis due to *Piophilha casei* have been reported from Egypt.<sup>29</sup> The case of 32-year-old male complaining of dysuria, fever and maggots in his urine was reported from Iraq. The causative agent was identified as the larvae of *Psychoda laterelle*.<sup>30</sup> A 37-year-old female from Paris was reported with a parasite syndrome caused by *F. canicularis* in her urinary tract.<sup>31</sup> El-Sayad and Shahab<sup>32</sup> reported the first case of human urinary myiasis due to *Sarcophaga* larvae in Egypt. Guven et al.<sup>33</sup> reported the case of 50-year-old female from Turkey who had undergone urinary bladder surgery and complained of having small, white, active particles in her urine. Examination of the material revealed the presence of larvae that were identified as *Psychoda albipennis*. The larvae of the same fly was reported in the urine of a 10-year-old female with the complaint of mild dysuria<sup>34</sup> and in a 55-year-old male from Turkey.<sup>35</sup> The Turkish patient was exposed to a great number of flies while working in his garden and reported killing many of these with his hands. He may have carried the eggs to his urethral opening with his unwashed hands while urinating. The larvae of this fly were also found to be responsible for the onset of myiasis of the urinary tract in a 29-year-old male and a 60-year-old male from Turkey.<sup>36,37</sup> A number of cases of urinary tract myiasis due to *P. albipennis* have been reported from Egypt.<sup>38–40</sup> Shakoor and

**Table 1.** Cases of human urogenital myiasis and their causative fly species

Reference no.	Author	Year	Myiasis type	Causative fly	Country
16	Leon	1921	Urinary tract myiasis	<i>Musca domestica</i>	Romania
12	Leclercq	1949	Urinary Tract myiasis	<i>Calliphora</i> sp.	—
11	Lopez-Neyra and Santiago-Estevez	1949	Urinary tract myiasis	<i>Wohlfahrtia magnifica</i>	Spain
13	Smith and Taylor	1966	Urinary tract myiasis	<i>Anisopus fenestralis</i>	Turkey
14	Morris	1968	Urinary tract myiasis	<i>Anisopus fenestralis</i>	Turkey
15	Thompson et al.	1970	Urinary tract myiasis	<i>Scenopinus</i> sp.	USA
17	Disney and Kurahashi	1976	Urinary tract myiasis	<i>Megaselia scalaris</i>	Japan
22	Kiyoshi and Ryo	1986	Urinary tract myiasis	<i>Telmatoscopus albipunctatus</i>	Japan
27	Lee	1989	Urinary tract myiasis	<i>Eristalis tenax</i>	Malaysia
20	Meinhardt and Disney	1989	Urinary tract myiasis	<i>Megaselia scalaris</i>	The Netherlands
21	Singh and Rana	1989	Urinary tract myiasis	<i>Megaselia scalaris</i>	India
10	Onorato	1992	Urinary tract myiasis	<i>Sarcophaga haemorrhoidalis</i>	Libya
28	Korzets et al.	1993	Urinary tract myiasis	<i>Eristalis tenax</i>	Israel
29	Saleh and el Sibae	1993	Urinary tract myiasis	<i>Piophilha casei</i>	Egypt
30	Abul-Hab and Salman	1999	Urinary tract myiasis	<i>Psychoda latereille</i>	Iraq
31	Perez-Eid and Mouffok	1999	Urinary tract myiasis	<i>Fannia canicularis</i>	Paris
32	El Sayad and Shehab	2002	Urinary tract myiasis	<i>Sarcophaga</i> sp.	Egypt
25	Hyun et al.	2004	Urinary tract myiasis	<i>Telmatoscopus albipunctatus</i>	Egypt
26	Mumcuoglu et al.	2005	Urinary tract myiasis	<i>Eristalis tenax</i>	Scandinavia
33	Guven et al.	2008	Urinary tract myiasis	<i>Psychoda albipennis</i>	Turkey
18	Wakid	2008	Urinary tract myiasis	<i>Megaselia scalaris</i>	Saudi Arabia
39	Ezzat and Younis	2009	Urinary tract myiasis	<i>Psychoda albipennis</i>	Egypt
41	Shakoor and Beg	2010	Urinary tract myiasis	Not identified	Pakistan
40	Lotfy	2011	Urinary tract myiasis	<i>Psychoda albipennis</i>	Egypt
36	Yenice et al.	2011	Urinary tract myiasis	<i>Psychoda albipennis</i>	Turkey
35	Oguz et al.	2012	Urinary tract myiasis	<i>Psychoda albipennis</i>	Turkey
23	El-Badry et al.	2014	Urinary tract myiasis	<i>Telmatoscopus albipunctatus</i>	Egypt
38	Yones et al.	2014	Urinary tract myiasis	<i>Psychoda albipennis</i>	Turkey
34	Demir et al.	2015	Urinary tract myiasis	<i>Psychoda albipennis</i>	Turkey
37	Karagüzel et al.	2015	Urinary tract myiasis	<i>Psychoda albipennis</i>	Turkey
42	Zaidi et al.	2016	Urinary tract myiasis	<i>Chrysomya bezziana</i>	Pakistan
24	El-Dib et al.	2017	Urinary tract myiasis	<i>Clogmia albipunctata</i>	Egypt
19	Solgi et al.	2017	Urinary tract myiasis	<i>Megaselia scalaris</i>	Iran
43	Schmidt	1970	Vulvar myiasis	<i>Scatopsidae</i> sp.	German
45	Ramalingam et al.	1980	Vulvar myiasis	<i>Chrysomya bezziana</i>	Malaysia
46	Koranantakul et al.	1991	Vulvar myiasis	<i>Chrysomya</i> sp.	Thailand
44	Cilia et al.	1992	Vulvar myiasis	<i>Sarcophaga</i> sp.	Spain
47	Dincer et al.	1995	Vulvar myiasis	<i>Psychoda</i> sp., <i>Sarcophaga</i> sp.	Turkey
48	Delir et al.	1999	Vulvar myiasis	<i>Wohlfahrtia magnifica</i>	Iran
50	Passos et al.	2002	Vulvar myiasis	<i>Cochliomyia hominivorax</i>	Brazil
49	Yazar et al.	2002	Vulvar myiasis	Not identified	Turkey
51	Silva et al.	2005	Vulvar myiasis	<i>Cochliomyia hominivorax</i>	Brazil
53	Wadhwa et al.	2006	Vulvar myiasis	<i>Chrysomya bezziana</i>	India
54	Atapattu	2010	Vulvar myiasis	Not identified	Sri Lanka
55	Sabyasachi et al.	2012	Vulvar myiasis	<i>Musca domestica</i>	India
52	Garbeloto et al.	2013	Vulvar myiasis	<i>Cochliomyia hominivorax</i> and <i>Dermatobia hominis</i>	Brazil
56	Gupta et al.	2013	Vulvar myiasis	Not reported	India
59	Kasinathan and Shanthini	2014	Vulvar myiasis	Not reported	India
58	Rawat et al.	2014	Vulvar myiasis	Not reported	India
57	Shrestha et al.	2014	Vulvar myiasis	Not reported	India

Continued

Table 1. Continued

Reference no.	Author	Year	Myiasis type	Causative fly	Country
60	Singhal and Bhugra	2015	Vulvar myiasis	Not reported	India
61	Jha et al.	2016	Vulvar myiasis	Not reported	Nepal
62	Patton	1922	Penile myiasis	<i>Chrysomya bezziana</i>	India
64	Petersen and Zachariae	1999	Penile myiasis	<i>Cordylobia anthropophaga</i>	Denmark
66	Passos et al.	2004	Penile myiasis	<i>Dermatobia hominis</i>	Brazil
65	Tavares et al.	2007	Penile myiasis	<i>Dermatobia hominis</i>	Brazil
67	Passos et al.	2008	Penile myiasis	<i>Dermatobia hominis</i>	Brazil
63	Daniel et al.	2009	Penile myiasis	<i>Chrysomya</i> sp.	Brazil
68	Salimi et al.	2010	Penile myiasis	<i>Wohlfahrtia magnifica</i>	Iran
71	Kaya et al.	2011	Penile myiasis	<i>Psychoda albipennis</i>	Turkey
69	Nagy	2012	Penile myiasis	<i>Lucilia sericata</i>	Slovakia
70	Singh and Sinha	2011	Penile myiasis	Not reported	India
72	Hossain et al.	2012	Penile myiasis	Not reported	Bangladesh
73	Ghavami and Djalilvand	2015	Penile myiasis	<i>Megaselia scalaris</i>	Iran
74	Rodriguez and Rashid	1996	Scrotal myiasis	<i>Dermatobia hominis</i>	USA
75	Yildiz et al.	1997	Scrotal myiasis	<i>Dermatobia hominis</i>	Turkey
76	Radotra et al.	2004	Internal genital myiasis	Not reported	India
77	Saldarriaga et al.	2011	Internal genital myiasis	<i>Sarcophaga</i> sp. and <i>Chrysomya</i> sp.	Colombia
78	Hezarjaribi et al.	2014	Internal genital myiasis	<i>Fannia scalaris</i>	Iran
79	Mondal et al.	2015	Internal genital myiasis	<i>Chrysomya megacephala</i>	India

Beg<sup>41</sup> reported the case of a 30-year-old female from Pakistan who complained of abdominal pain and dysuria and noticed larvae in her urine. Another case was reported in a Pakistani child due to the blow fly, *Chrysomya bezziana*.<sup>42</sup>

## Genital myiasis

Genital myiasis is observed in individuals living in the tropics who neither wear undergarments nor practice genital hygiene. The lack of sanitation and the presence of soiled diapers generally attract parasitic flies to a household. Genital myiasis is associated with predisposing factors such as poor hygiene, limited mobility, low socio-economic status, penile mutilation and female genital mutilation. Depending on the anatomical location, this condition can be further subclassified as external or internal genital myiasis. External genital myiasis is clinically and entomologically similar to wound myiasis but affects women more than men. It includes vaginal or vulvar myiasis and penile myiasis, depending upon the genitals involved. In contrast, internal genital myiasis is a rare condition that occurs when maggots reach an internal genital organ, such as the uterine cavity.

## External genital myiasis

### Vulvar myiasis

Cases of vulvar myiasis have been reported due to *Sarcophaga* sp. in a female from Germany<sup>43</sup> and an 86-year-old diabetic female from Spain.<sup>44</sup> Ramalingam et al.<sup>45</sup> reported a case of vulvar myiasis in a 76-year-old female from Malaysia suffering

from carcinoma of the rectum. The larvae were obtained from ulcers near the external genitalia and urethral opening. Poor personal hygiene and living in a crowded village with poor sanitation underlay the development of vulvar myiasis in a 29-year-old female with an ulcerative wound. The causative agent was identified as larvae of *Chrysomya* sp.<sup>46</sup> Cases of vulvar myiasis have been reported from Turkey with *Psychoda* sp. and *Sarcophaga* sp.<sup>47</sup> *Wohlfahrtia magnifica* has been reported in cases of vulvar myiasis in a 20-year-old Iranian female<sup>48</sup> and a 31-year-old female from Turkey who was expelling worms from her vulva. The fly that deposited ova in the patient's genital cavity might have been attracted by odour caused by poor personal hygiene or genital co-infections.<sup>49</sup> Passos et al.<sup>50</sup> reported cases of vulvar myiasis due to *Sarcophaga* during pregnancy in a 19-year-old female from Brazil and a 17-year-old female with condylomatous lesions of the vulva, vaginal introitus and the perineum accompanied by the infestation of multiple larvae of the fly *Cochliomyia hominivorax*. The case of a 56-year-old Brazilian female with psychiatric disturbance was reported due to *C. hominivorax*. Large numbers of larvae were removed from a necrotic wound in the vulvar and perineal areas.<sup>51</sup> Cases of genital myiasis have been reported due to *C. hominivorax* in an 18-year-old female homeless drug addict, a 70-year-old female and a 68-year-old female with Alzheimer's disease from Brazil.<sup>52</sup> A 30-year-old female reported the appearance of a furuncle on her vulva and the maggots therein were identified as the fly *Dermatobia hominis*.<sup>52</sup> Wadhwa et al.<sup>53</sup> reported a case of vulvar myiasis in a 45-year-old female from India suffering from carcinoma of the cervix (grade III) for 2 y. The larvae were identified as *Chrysomya bezziana*. Genital myiasis was

reported in a 16-year-old female from Sri Lanka with a history of vulval irritation and vaginal discharge. The labia minora of the left side was oedematous and inflamed with maggots in the perineum. The patient used folded cloth instead of sanitary pads during menstrual bleeding and hung the washed cloth on a clothesline outdoors before reuse.<sup>54</sup> A 77-year-old female presented with genital pruritus, vague perineal discomfort, bleeding and foul-smelling vaginal discharge had an ulcer with maggots of *Musca domestica*.<sup>55</sup> A 17-year-old female from India presented with a history of pain and swelling in the genitalia. Her non-hygienic outdoor toilet attracted many flies.<sup>56</sup> Another case was a 68-year-old post-menopausal female from Nepal, suffering from vulvar carcinoma, who complained of pain and bleeding in the vulvar lesion for 1 week. Multiple small openings were present in the foul-smelling necrotic tissue and multiple live maggots were found.<sup>57</sup> Rawat et al.<sup>58</sup> reported an 18-year-old female from India with a history of vulvar pain and swelling along with the dropping of fly larvae from her genitals for the last 15 days. She lived in a rural area in conditions of poor hygiene and defecated in the open outside the house. An 80-year-old female from India complaining of a mass descending from her vagina had a 5 cm×5 cm ulcerated wound on the vulvar region with multiple holes and numerous maggots. The patient was an agricultural labourer, belonging to a low socio-economic class, and had poor personal hygiene.<sup>59</sup> A 72-year-old female presented with a complaint of pain and vaginal discharge for 5 d. The floor of her ulcer was covered with foul-smelling slough with numerous maggots.<sup>60</sup> Jha et al.<sup>61</sup> reported a case of vulvar myiasis in early pregnancy in a 25-year-old female from Nepal who presented with a burning sensation and itching in her vulvar area.

### Penile myiasis

Patton<sup>62</sup> described a case of penile myiasis from Punjab, India, where the patient was circumcised by a native quack. After 15 days the wound became infected and a sloughing ulcer formed at the end of the penis. The causative agent for the infestation was the larvae of *C. bezziana*. The case of a 71-year-old man from Brazil with complaints of pruritus and pain in the periurethral area was reported, with evidence of small worms on the surface of the urethral catheter. The mature larvae were identified as *Chrysomya* sp.<sup>63</sup> Petersen and Zachariae<sup>64</sup> reported the case of 10-year-old male from Denmark with acute balanoposthitis caused by *Cordylobia anthropophaga* larvae. Larvae of *D. hominis* were reported from Brazil in a 41-year-old male patient,<sup>65</sup> a 21-year-old male patient<sup>66</sup> and a 62-year-old male patient<sup>67</sup> with myiasis of penile carcinoma. Salimi et al.<sup>68</sup> reported an 86-year-old male from Iran who had developed a penile ulcer with numerous live and motile larvae in the ventral region of glans penis. The causative agents were the larvae of *Lucilia sericata* and *Wohlfahrtia magnifica*. Cases of penile myiasis due to *L. sericata* have been reported from Slovakia in a 66-year-old male with urinary bladder malignancy along with a non-functioning left kidney and a 43-year-old alcoholic male suffering from gangrene with offensive odour in the urogenital area. Penile, scrotal and inguinal surfaces were necrotic with numerous live maggots.<sup>69</sup> A 70-year-old male patient from

India complaining of an ulcer on the glans penis was admitted to a local hospital. Numerous maggots of unidentified fly species emerged during wound debridement.<sup>70</sup> Larvae of the fly *Psychoda albipennis* were reported to cause penile myiasis in a 29-year-old male from Turkey.<sup>71</sup> Hossain et al.<sup>72</sup> reported the case of 10-year-old male from Bangladesh with pain in the penile region due to circumcision. The complication appeared to be the result of unsterilized instruments and improper technique in handling the wound. Numerous maggots of unknown fly species were recovered from the wound. Third instar larvae of the scuttle fly, *Megaselia scalaris*, were reported in a penile ulcer in an 18-year-old male from Iran. It is likely that *M. scalaris* deposited eggs on his underwear or directly on the urogenital area after being attracted by the urine odor.<sup>73</sup> Cases of human scrotal myiasis caused by the larvae of *D. hominis* have been reported from the USA<sup>74</sup> and a 21-year-old male from Turkey.<sup>75</sup>

### Internal genital myiasis

Radotra et al.<sup>76</sup> reported the case of a 25-year-old female from India with a cancerous genital growth at the 38th week of gestation. The lesion was infected and ulcerated, with foul-smelling discharge that was infested with maggots. The larvae of flies belonging to *Sarcophaga* and *Chrysomya* spp. have been reported to infest a prolapsed uterus in an 82-year-old female from Colombia.<sup>77</sup> Hezarjaribi et al.<sup>78</sup> reported a 36-year-old female from Iran who complained of a burning sensation in the vagina. On examination, 30 larvae were found in the introitus and vaginal canal. The larvae were identified as *F. scalaris*. The fly that deposited ova in the patient's genital cavity might have been attracted by the odour caused by poor personal hygiene and genital co-infections. Internal genital myiasis due to *Chrysomya megacephala* have been reported in a 22-year-old female from India.<sup>79</sup> These cases highlight the significance of maintaining personal hygiene and sanitation to avoid larval infestations.

### Prevention and control of urogenital myiasis

No single management plan has been outlined for urogenital myiasis in the literature. There are basically three levels at which prevention and control of urogenital myiasis can be implemented. Suppression or eradication of fly populations is the first and most important control measure. This involves the destruction of fly breeding places, which can be achieved by burial of garbage and animal carcasses. Second, prophylactic measures such as the avoidance of wound infestation are needed. For the prevention of myiasis, dressing and covering of wounds will stop infestations by fly species that would otherwise deposit eggs or larvae into open wounds. Particular attention should be given to the wound dressings and plaster casts of elderly or infirm patients, because these can actually conceal infestations to which these patients are unable to respond. However, where a high risk of myiasis is expected, even these wounds can be protected by covering them with mosquito netting. Regular inspection of wounds to minimize the development of damage caused by any larvae that are deposited is an effective measure for the prevention of myiasis. Fly screens can be placed over windows

to prevent fly entry and fly traps can be installed in rooms and corridors to catch and kill any flies that do enter. Third, is the treatment of myiasis because of failure of the first two measures. This involves the manual removal of larvae or the application of systemic therapeutic agents such as ivermectin. The use of finger pressure on both sides of the lesion and removal of the larvae with forceps is quite useful. Surgical removal can sometimes result in damage to the larva, with the retention of larval fragments in the wound, possibly leading to allergic complications.

## Conclusions

Although human urogenital myiasis is an outcome of ignorance, it can also be an indicator of neglected wound care and poor personal hygiene. Moreover, in health care situations it can cause complications beyond the medical repercussions, such as severe psychological trauma for the patient and damage to the reputation of the health care facility. The condition can be avoided by adopting good personal hygiene practices and maintaining neat and clean surroundings. Authors emphasize that helpless and debilitated patients should be given extra care. Above all, creating awareness about this issue and controlling the fly population are required to overcome the menace of human myiasis.

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