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Todd, Stacey; Squire, Bertel; Bartlett, Robert; Lepping, Peter

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1 **Delusional Infestation managed in a combined Tropical Medicine and Psychiatry clinic**

2 Stacy Todd<sup>a,b</sup>, S. Bertel Squire<sup>a,b</sup>, Robert Barlett<sup>c</sup>, Peter Lepping<sup>d</sup>

3

4 a. Tropical and Infectious Disease Unit, Royal Liverpool University Hospital, UK

5 b. Liverpool School of Tropical Medicine, UK

6 c. Nant Y Glyn Community Mental Health Centre, Colwyn Bay, UK

7 d. Heddfan Psychiatric Unit, Liaison Psychiatry, BCULHB, Wrexham & Centre for Mental Health

8 and Society, Bangor University, UK & Mysore Medical College and Research Institute,

9 Mysore, India

10

11 **Corresponding Author:**

12 Stacy Todd, Telephone 0151 706 3836

13 Email: stacy.todd@lstm.ac.uk

14

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1 **Abstract (217/220 word limit)**

2 **Introduction**

3 Delusional infestation is a well-recognised delusional disorder presenting as the persisting belief of  
4 the presence of parasitic or other infestations. Combined clinics have been run by dermatology and  
5 psychiatry in a small number of centres. Here we report the first few years of a unique combined  
6 clinic run with experts in infectious diseases/tropical medicine and psychiatric management of  
7 delusional infestation.

8 **Methods**

9 Review of all patients seen at the combined assessment clinics run at LSTM between 19 December  
10 2011 and 31 October 2016. Data were collected prospectively as part of clinical assessment.  
11 Descriptive analysis of these data was performed to examine clinical features at assessment,  
12 investigations performed and treatment outcomes.

13 **Results**

14 Seventy-five patients were assessed. 52 (69%) were given the formal diagnosis of delusional  
15 infestation. 64% of individuals gave a history of travel but no significant tropical or infectious  
16 diagnosis was made. 61% of those who returned for follow-up reported improvement in symptoms.  
17 The CGI-S improvement was 1.36 for the DI patients, but only 0.63 for non-DI patients. DI patients  
18 were more impaired at baseline (5.0 vs 4.1). Health anxiety was the commonest diagnosis seen in  
19 those not considered to have DI.

20 **Conclusion**

21 Combined clinics to treat DI are effective in improving patient outcome. A significant minority of  
22 patients referred do not have a diagnosis of DI.

23

24 Keywords: Combined clinics, Delusional infestation, infectious diseases, tropical medicine, psychiatry

25

## 1 **Introduction**

2 Delusional infestation (DI, previously known as delusional parasitosis or Ekbom's syndrome) usually  
3 causes considerable difficulty for patients and has been recognised by clinicians for over 100 years  
4 (1-3). The condition presents as a fixed belief that the patient's skin, body or environment is infested  
5 by living or inanimate pathogens with no medical evidence for this. Primary cases of DI meet the  
6 criteria for persistent delusional disorder within ICD-10 (F22.0). Secondary cases related to  
7 substance misuse, prescribed drugs (such as dopaminergic agents) and medical and psychiatric  
8 diagnosis are also well recognised (3). Research into the underlying mechanism for DI suggest  
9 dysfunction within the regions of the brain responsible for judgement, sensation and learning,  
10 supporting the hypothesis that these delusional beliefs are due to misinterpretations of peripheral  
11 signals that result in favouring of an unlikely explanation of these sensations (errors of probabilistic  
12 reasoning) (4). Antipsychotic medication has been shown to improve symptoms in DI (5-7),  
13 however, engaging patients can be challenging, resulting in high rates of non-adherence to  
14 recommended medication (8, 9). Combined clinical services with dermatology or other medical  
15 services have been proposed as the optimal way to manage patients with DI, allowing them to  
16 engage with psychiatric services (10). There is increasing evidence that this approach is likely to be  
17 cost effective in reducing the overall number of investigations and repeat referrals which can occur  
18 in DI (11).

19 Much less common is a combined clinical service run in conjunction with infectious disease or  
20 tropical medicine specialists. Currently, we are only aware of such clinics in Liverpool and Berlin.  
21 However, the Berlin clinic only has access to psychiatric expertise, rather than being a truly jointly  
22 run clinic. UK residents are travelling abroad more frequently (12) with increased exposure risks for  
23 unusual infections and infestations. Travel has previously been described as a possible trigger for DI  
24 (13, 14), as well as reports of cultural variation in the presentation of DI in different parts of the  
25 globe (15-18). There have also been reports of DI where an individual could have been exposed to  
26 parasitic infection such as entomologists (Stanhope, Carver et al. 2015) or animal owners presenting  
27 to vets with alleged symptoms of infestation in their pets. (19-21). This paper discusses the  
28 experience of a combined psychiatry and tropical medicine clinic for DI, prevalence of illnesses in the  
29 patients assessed, outcomes, the approach used in the clinic, and a review of clinical database of  
30 cases.

## 31 **Methods**

32 A combined psychiatry and tropical medicine clinic has been running twice per month since 2011 at  
33 the Liverpool School of Tropical Medicine, UK. Referrals are accepted from within the Merseyside

1 and North Wales regions as well of out of area referrals. Referrals were accepted from primary and  
2 secondary care and were screened by consultants from both disciplines for suitability (Figure 1). The  
3 aim of this screening process is to identify those patients felt most likely to have DI rather than  
4 requiring assessment at the general tropical medicine clinic. Criteria identified in referral letters  
5 which led to prioritisation for assessment in the DI clinic include a history suggestive of DI (a  
6 persistent, strong belief of being infested in combination with unusual constellations of symptoms),  
7 a previous diagnosis of DI made by a colleague, and the duration and degree of distress associated  
8 with the symptoms. . Prior to attending the clinic, patients are asked to have basic routine blood  
9 tests (full blood count, urea and electrolytes, liver function test) and an ECG. This is to help with the  
10 exclusion of real infestations (high eosinophil count) and provides a baseline QTc interval in case  
11 antipsychotics are suggested. Each clinic session is booked for 1 hour, and an introduction of all  
12 team members and the aims of the clinic is performed at the beginning of each clinic. The  
13 psychiatrist is introduced as an integral part of the clinic, as symptoms such as those experienced by  
14 the patient often cause significant distress and can be associated with psychiatric morbidity. The  
15 initial clinic appointment is led by the Tropical Medicine Consultant taking a classical medical history  
16 and examination. Important parts of the history include any travel history or other activities which  
17 could expose an individual to unusual infections or infestations. Examination includes a close  
18 examination of areas of concern for the patient, perceived areas of skin change or infestation.  
19 Investigations are limited only to those, which the tropical medicine consultant feels are appropriate  
20 given the history and examination. Any specimens brought by the patient are reviewed in the  
21 diagnostic parasitology laboratory. It is pointed out that this is a specialist laboratory able to identify  
22 most known parasites by microscopy. Patients are encouraged to provide specimens for examination  
23 because it helps with any later explanations of the assessment. Where appropriate, a diagnosis of  
24 primary DI (persistent delusional disorder within ICD-10; F22.0), or of DI in the context of another  
25 illness (secondary DI) (10) is made. In accordance with ICD-10 F22.0, a diagnosis of primary DI is  
26 made in the presence of a persistent stable delusional belief of being infested as the main clinical  
27 feature in the absence of schizophrenic symptoms, marked blunted affect or evidence of organic  
28 brain disease. In the presence of other organic, psychiatric or neurological disorders, a diagnosis of  
29 secondary DI is made. Alternative diagnoses were made according to standard diagnostic criteria, of  
30 note the diagnosis of 'Health Anxiety' was made with reference to ICD-10 F45.2 Hypochondriacal  
31 disorder.

32 At this stage the Tropical Medicine consultant explains to the patient whether we feel that the  
33 presentation is likely to be due to infestation or not, and the rationale behind this decision. It is  
34 pointed out that the patient's symptoms are believed and that the clinicians' intention is to identify

1 the cause of those symptoms with an open mind. If DI is felt to be a likely diagnosis, the clinicians  
2 explain three possible options with the aim of introducing the possibility of a non-parasitic  
3 explanation of the symptoms to the patient. The three explanations include a hitherto unknown  
4 infestation, an infestation which has subsided but left the patient with residual symptoms, or an  
5 illness of the brain. If the feeling of the team is that this is likely to be DI then the Psychiatrist  
6 present may take over leading the consultation at this stage. We offer the explanation that  
7 sensations can be abnormally interpreted by the brain; and the benefit of anti-psychotic medication  
8 in ameliorating these are emphasised. We do not explicitly explain the diagnosis as a delusional  
9 illness at an early stage unless the patient specifically asks. Follow-up sessions are structured along  
10 similar lines with Tropical Medicine consultant's emphasising the lack of physical evidence of  
11 infestation and risk factors whereas the psychiatrist emphasises the problems with errors of  
12 probabilistic reasoning, encouraging adherence to medication.

13 Patients often respond with a high degree of scepticism to any explanation of symptoms that does  
14 not fit their own (of being infested). However, by building up rapport and trust it is often possible  
15 to persuade patients to try medication against their "better judgment". In other words, they may try  
16 the medication because they are persuaded by the possibility of an alternative explanation, because  
17 they trust the doctors to have their best interest at heart, or because they feel they have nothing to  
18 lose by trying. Occasionally, they become dismissive and it requires skill to keep them on board,  
19 which is possible in most cases. The degree to which patients are able to consider an alternative  
20 explanation usually corresponds with the degree of their delusional intensity.

21 A clinical database was collected prospectively focusing on initial assessment, duration and severity  
22 of symptoms, clinical diagnosis made during assessment and follow-up appointments. Additional  
23 information on clinical presentation and previous investigations was collected from clinical notes  
24 and clinic letters retrospectively, and added to the database. Descriptive statistics were used. The  
25 nature of the clinic meant that formalised statistical analysis was not carried out. Data were  
26 presented according to final clinical diagnosis and categorised as i) all DI (primary and secondary  
27 combined) and ii) non-DI patients. Outcome data are collected with Clinical Global Impressions Scale  
28 (CGI-S) (22), which are routinely generated for most patients. CGI-S scores are clinician rated, well  
29 validated, have high inter-rated reliability and take a holistic approach to the patient's overall level  
30 of impairment. A score of 1 means "no illness" whilst the highest score of 7 means "one of the worst  
31 cases seen".

## 32 **Results**

1 Seventy-five patients attended for assessment between 19 December 2011 and 31 October 2016  
2 (Table 1). Approximately two thirds of clinic attendees were diagnosed with DI (n=52/75), two of  
3 whom had a shared delusional belief. This shows a reasonably successful screening process. No  
4 patient objected to the presence of the psychiatrist. Five patients had secondary DI, with illicit drug  
5 use (cannabis, amphetamines and cocaine), schizoaffective disorder, depression, and dopaminergic  
6 Parkinson's drugs being the causes. Health anxiety was the commonest diagnosis seen in those not  
7 considered to have DI (n=8/23). All patients with health anxiety fulfilled general ICD-10 criteria for  
8 F45.2 (hypochondriacal disorder, sometimes known as illness anxiety disorder), but some focussed  
9 their anxieties on overvalued ideas about infestations. Other causes included: Irritable Bowel  
10 Syndrome (2), Depression (2), no illness identified (2), Anxiety (2), Depression and anxiety (1),  
11 Chronic Fatigue Syndrome (1), gut motility disorder (1), impetigo (1), idiopathic pruritus ani (1),  
12 diagnostic uncertainty (2). Psychiatric diagnoses were made using ICD-10 criteria; some patients  
13 came with diagnoses made by external clinicians, which we confirmed. Reported symptoms were  
14 very similar between DI and non-DI patients, abnormal sensation were common in non-DI patients  
15 but almost universally seen in DI (Table 2). Most patients had been investigated previously and had  
16 often seen multiple specialties as well as attending private clinics and private (unregulated)  
17 laboratories. Previous treatment for parasitic infestation was common, often initially by GPs and  
18 then procured from alternative sources by patients. Multiple courses of anti-helmenthic or anti-  
19 parasitic agents had often been taken. Symptoms had often been present for many years (up to 20  
20 years in some cases). Patients commonly reported medical co-morbidities but this was seen more  
21 frequently in those not diagnosed with DI. A previous psychiatric diagnosis was present in around  
22 40% of patients of both groups.

23 Patients were investigated in accordance with the agreed approach in clinic. Only tests, which the  
24 Tropical Medicine Physician felt were appropriate were done. However, all specimens brought to  
25 clinic were reviewed. The specimen sign at the first clinic appointment was commoner in those with  
26 DI (39%, 20/52 vs 30% 7/23), but when requested to produce a specimen after clinic review this  
27 increased in both groups (58% 30/52 vs 48% 11/23). The majority of specimens demonstrated  
28 normal epithelial cells, skin debris and vegetable matter. Four samples demonstrated insects  
29 including one head louse, one cat flea, one non-biting midge and a carpet beetle. Stool microscopy  
30 was performed on approximately 43% of both DI and non-DI patients (22/52 vs 10/23). One patient  
31 had *Entamoeba Histolytica/Coli* and *Blastocystis* identified in their stool but it was not felt that this  
32 was the cause of their symptoms (DI secondary to cannabis use, good response to antipsychotics).  
33 Eosinophilia was seen in around 25% of all patients (13/52 vs 6/23). This was generally low level and  
34 not confirmed on repeat testing. Serology was performed more commonly in patients with DI (46%

1 24/52 vs 26% 6/23), including any relevant non-infectious tests such as autoantibody screen. No  
2 tropical infections or autoimmune conditions were identified through this screening.

3 Patient outcome was variable. Loss to follow-up and erratic-attendance at follow-up clinic  
4 appointments was common (Table 3). A few patients requested discharge from clinic as they did not  
5 agree with the diagnosis of DI or the treatment approach. 77% of patients diagnosed with DI were  
6 offered antipsychotics at some time during their clinic attendance, but only 28% of these reported  
7 good adherence to treatment. Interestingly, patients who reported good or partial adherence to  
8 antipsychotics had a longer average duration of symptoms (67.8 (sd 72) and 82.6 (sd 83) months  
9 respectively) than those with poor adherence (23.8 (sd 18.1) months). 57% of those who returned  
10 for follow-up appointments reported an improvement in their symptoms.

## 11 **Discussion**

12 Joint or combined clinics between Liaison Psychiatry and either dermatology or tropical medicine  
13 have been proposed as a way forward in the treatment of DI, although few such clinics exist. The  
14 overall success rate in our combined clinic was good with 61% of those who were not lost to follow  
15 up reporting improvement. Unsurprisingly, those with good adherence improved much more  
16 (almost 2 CGI-S scores reduction) than those with poor adherence who showed little improvement.  
17 31% of all patients seen were not diagnosed with DI, which seems acceptable for a clinic that sees  
18 patients with a complex infestation symptom history. Equally, it suggests that the clinicians keep an  
19 open mind with regards to the diagnosis, which is an important aspect of the clinic's approach. No  
20 infestations were identified, suggesting an excellent screening process with regard to identifying  
21 patients without actual current infestations. 40% of our DI patients had a past psychiatric history,  
22 which is similar to research done at a psycho-dermatology clinic in London where DI patients are  
23 seen (23).

24 With regards to the alleged pathogens and symptoms we had a high number of alleged worms  
25 compared to previous studies (31% in our sample, compared to 6% in a previous sample) (24). In a  
26 previous study (25) it was the combined clinic in Berlin, also run by a School of Tropical Medicine,  
27 which had most alleged worms in their sample. In comparison, all combined clinics run with  
28 dermatologists had few patients complaining of alleged worms. This indicates there are differences  
29 amongst combined clinics with clinics run by dermatologists where skin complaints rather than  
30 systemic infestations seem to be the main presenting problem, having a different focus of patient  
31 complaints. These differences are confirmed by our finding that our patients almost all complain  
32 about abnormal sensations, whereas few have primary skin complaints. We also know from further  
33 analysis of our group's data that despite this difference, the baseline CGI-S scores appear to be very



1 similar in all specialist clinic settings (26). This shows that the overall impairment of patients because  
2 of the illness is similar in all settings despite a different patient mix. It is unclear at this point whether  
3 specific presentations of DI may be more difficult to treat than others. Anecdotally, we believe that  
4 patients who present with systemic rather than defined skin symptoms may be more difficult to  
5 treat, because it is more difficult to discuss diagnosis them with unspecific terms such as  
6 “unexplained dermatopathy”, and it is rarely possible to give them dermatological treatment to  
7 facilitate engagement in the treatment process.

8 In our patients, those with a diagnosis of DI were significantly more impaired at baseline with a  
9 whole CGI-S score difference compared to those without a DI diagnosis. Otherwise, the two samples  
10 were remarkably similar. The only other significant difference was the lack of illicit drug use in the  
11 non-DI group compared to the DI group. These findings do not suggest any specific indicators that  
12 can differentiate DI and non-DI patient *a priori* to aid the screening process.

13 Recent research has shown that the longer DI remains untreated, the worse the prognosis becomes  
14 (26), increasing pressure to intervene early with DI patients. This increases the need for specialist  
15 settings, as treatment rejection is high in routine primary care or dermatology settings (3). It also  
16 highlights the need for early referral and treatment to optimise outcome. In combined clinics with  
17 dermatology and psychiatry the cost effectiveness of such clinics has already been shown, compared  
18 to standard treatment per year prior to referral to the combined clinic. Altaf et al showed a 42%  
19 reduction in overall treatment costs, indicating that psychodermatology clinics are a cost-effective  
20 service for managing patients with DI (11). We have not formally evaluated the cost-effectiveness of  
21 our clinic but it is likely that any effective combined clinic will reduce costs.

22 The disadvantage of tertiary settings is that it may be difficult to link in with local psychiatric or  
23 primary care services, or, if the patient does not improve, there may be no back-up system or  
24 associated community service that can take over the engagement of the patient. Long-term  
25 aftercare therefore remains a problem when patients refuse to engage with local services. It begs  
26 the question whether Tropical Medicine/Infectious Diseases services along with Dermatology should  
27 be up-skilled to deal with DI patients more effectively without the need for rare tertiary services to  
28 widen the options for patients and improve referral to treatment times. Given the complexity of  
29 some of the psychiatric aspects of the illness (risk, antipsychotic treatment, possible use of mental  
30 health legislation) close links with local psychiatric services should promote the safety and feasibility  
31 of such an up-skilling process.

32

1 **Conclusion**

2 Combined clinics for DI between Tropical Medicine/Infectious Diseases and Psychiatry services are  
3 effective in delivering improved outcomes. The patients' symptom focus differs somewhat from  
4 those presenting to Dermatology, presenting additional challenges. Early treatment remains  
5 important. The lack of combined clinics makes the up-skilling of infectious disease/tropical medicine  
6 clinicians in DI desirable.

7

8

1 **Authors Statement**

2 Authors' Contributions: PW and SBS conceived the study and carried out clinical assessments. RB  
3 extracted and cleaned data. ST analysed data. ST and PL wrote first draft. All authors reviewed final  
4 draft. SBS and PL are guarantors for the paper.

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6 service.

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8

9 Conflicts of interest: None declared

10

11 Ethical approval: In line with UK Health Regulatory Authority guidance this work was conducted as a  
12 service evaluation rather than research and no specific ethics review was therefore required. Only  
13 data routinely collected for clinical assessment was included and patients were not contacted for  
14 additional information.

15

16

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18

19

20 Figure caption

21 Figure 1 Flow chart of study screening process and clinical approach. DI = Delusional Infestation.

22

**Table 1 Baseline assessment**

	<b>DI (n=52)</b>	<b>Non-DI (n=23)</b>
<b>Age (Med (IQR))</b>	56.7	49.7
<b>Sex (Female, %)</b>	35 (67%)	20 (87%)
<b>Referral Source (%)</b>		
<b>GP</b>	38 (73%)	18 (78%)
<b>ID/Trop Med</b>	3 (6%)	0
<b>Dermatology</b>	7 (14%)	2 (9%)
<b>Psychiatry</b>	1 (2%)	0
<b>Other</b>	3 (6%)	2 (9%)
<b>Duration of Symptoms (months,sd)</b>	56 (sd 62)	66 (sd 73)
<b>Previous Investigations (Yes, %)</b>	42 (82%)	20 (87%)
<b>Tropical travel history (Yes, %)</b>	36 (69%)	12 (57%)
<b>Any previous treatment for parasitic infestation (%)</b>	46 (89%)	15 (68%)
<b>Accompanied at clinic (%)</b>	19 (37%)	4 (20%)
<b>Medical PMH (%)</b>	46 (89%)	22 (96%)
<b>Psychiatric PMH (%)</b>	21 (40%)	9 (39%)
<b>Illicit drug use reported (%)</b>	5 (10%)	0
<b>Drug of Abuse Screen Positive</b>	6 (12%)	3 (13%)
<b>CGI-S</b>	5.02 (sd 0.71)	4.09 (sd 1.06)
<b>Visual impairment (%)</b>	10 (19%)	2 (9%)

Key: sd = standard deviation, PMH = Past Medical History, CGI = Clinical Global Impression Score

**Table 2 Patient Reported Symptoms\***

	<b>DI (n=52)</b>	<b>Non-DI (n=23)</b>
<b>Skin Change</b>	57% (27/47)	55% (12/22)
<b>Abnormal sensation</b>	98% (49/50)	85% (17/20)
<b>'Worms' in stool</b>	31% (15/49)	38% (8/21)
<b>Pruritis Ani</b>	37% (10/27)	33% (5/15)
<b>Poor Sleep</b>	81% (13/16)	100% (6/6)

\*Not all patients had this information recorded. Percentage is for the patients with available information

**Table 3 Outcome**

	<b>DI (n=52)</b>	<b>Non-DI (n=23)</b>
<b>Median number of follow-up appointments (Inter Quartile Range)</b>	2 (1-3)	2 (1-2)
<b>Lost to follow-up/ missed follow-up appointments</b>	22/52 (42%)	4/23 (17%)
<b>Offered antipsychotics at DI Clinic</b>	40/52 (77%)	0/23
<b>Reported adherence to antipsychotics</b>		
<b>Good</b>	11/40 (28%)	
<b>Partial</b>	8/40 (20%)	
<b>Poor</b>	10/40 (25%)	
<b>Refused Treatment</b>	4/40 (10%)	
<b>Unknown/Lost to follow up</b>	7/40 (17%)	
<b>Reported improvement in symptoms</b>	22/36 (61%)	7/11 (63%)
<b>CGI-Schange</b>		
<b>Overall</b>	-1.36 (sd 1.71)	-0.625 (sd 1.2)
<b>Reported treatment adherence</b>		
<b>Good</b>	-1.75 (sd 1.58)	
<b>Partial</b>	-1.63 (sd 1.76)	
<b>Poor</b>	-0.29 (sd 1.3)	

Key: sd = standard deviation, CGI-S = Clinical Global Impression Score