

## Contagious Itch, Disgust and Empathy in a Family with Scabies and their Treating Medical Staff: An Exploratory Study

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The induction of itch by (audio-)visual stimuli, is referred to as “contagious itch” (CI) (1, 2). Most clinicians treating patients with ectoparasites have probably experienced this phenomenon. There is some evidence in the medical literature that CI may be associated with disgust and empathy (3). Disgust is an emotional response of revulsion to something potentially harmful. Kamber et al. (3) hypothesized that CI and disgust are complementary parasite defence mechanisms that are often co-activated.

Empathy is a psychological concept enabling individuals to understand the emotions of others (4). It is thought that CI and empathy may be linked via the mirror neurone system, which plays an integral role in the development of empathy and socially contagious behaviours, such as yawning, laughing and CI (1, 5, 6).

*Sarcoptes scabiei* typically infests families or groups of people, often resulting in clustered outbreaks. If treatment in an outpatient setting fails, hospitalization of all affected family members may be indicated, in order to repeat anti-scabies treatment, decontaminate clothes and initiate domestic environmental measures.

To our knowledge, the relationship between CI, disgust and empathy has not been studied to date. The aim of this study was therefore to assess the prevalence and intensity of CI and disgust amongst the treating medical staff exposed to a family infested with scabies and within the infested family itself.

### MATERIALS, METHODS AND RESULTS

This cross-sectional, questionnaire-based, single-centre study was conducted at the Department of Dermatology, University Hospital Basel, Basel, Switzerland. Diagnosis of scabies was confirmed by dermoscopy and/or skin scrapings.

Family members aged  $\geq 8$  years and healthcare professionals (physicians, nurses, nurse aids, medical students) aged  $\geq 16$  years, who had direct contact with the family (i.e. conversation with all members for at least 10 min) were eligible to participate. All questionnaires were completed upon admission.

Healthcare professionals completed a 7-item-questionnaire addressing demographic information, personal dermatological conditions and intensity of itch on a 0–10 numerical rating scale (NRS, 0: no itch, 10: worst itch imaginable): (i) before interacting with the patient, (ii) while taking the patient’s history, (iii) when seeing scabies lesions, and (iv) when seeing patients scratching themselves. In addition, the intensity of scabies-related disgust and empathy with the family were assessed using 0–10 NRS (0: no disgust/empathy; 10: worst disgust/highest empathy imaginable). Empathy was further assessed with the Saarbrücken Personality Questionnaire (SPQ), a well-established 16-item tool (7).

The family members completed a 10-item questionnaire addressing demographic information, previous dermatological conditions, mean scabies-related “background” itch on a 0–10 NRS, the mean increase of itch when: (i) seeing skin lesions of other family members, (ii) talking about scabies/itch, and (iii) seeing family members scratching themselves. Intensity of scabies-related disgust and empathy with other infested family members were assessed using a 0–10 NRS, in addition the SPQ was completed.

#### Statistical analysis

Descriptive statistical analysis was computed using SPSS (21 software, IBM Corp., Armonk, NY, USA). Spearman’s rank correlation was performed to correlate itch, disgust and empathy. Wilcoxon signed-rank tests were used to compare the change in itch and disgust (maximum vs baseline) caused by visual and verbal stimuli.

The study was approved by the Ethics Committee Northwest and Central Switzerland (EKNZ Req-2020-01089; ClinicalTrials.gov identifier NCT04557644).

#### Results

A total of 19 healthcare professionals participated in the study (mean age  $28.8 \pm 8.2$  years, 7 physicians, 3 medical students, 9 nurses and nursing aids), 1 of whom had a history of skin disease (seborrhoeic eczema). The family comprised 5 individuals (age  $30.2 \pm 24.8$  years), dermatological history was negative for all, their mean scabies-related itch (“background itch”) was  $4.0 \pm 2.7$  NRS. The prevalence and intensities of CI, disgust and empathy reported by the staff and family members, respectively, are shown in Fig. 1.

Amongst the staff, only auditory exposition triggered CI significantly compared with baseline (NRS 0 vs  $1.6 \pm 2.0$  NRS;  $p=0.03$ ), but not visual exposition (NRS 0 vs seeing lesions  $1.1 \pm 2.0$ ,  $p=0.15$ ; NRS 0 vs seeing scratching  $1.0 \pm 1.9$ ,  $p=0.20$ ) (Fig. 2).

The relationships between the perceptions contagious itch, disgust and empathy in the medical staff expressed by Spearman’s correlations are shown in Table 1. The sample size of the family was too small for statistical analysis.

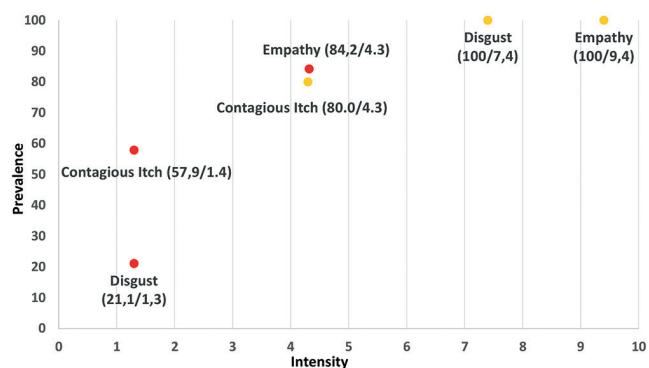
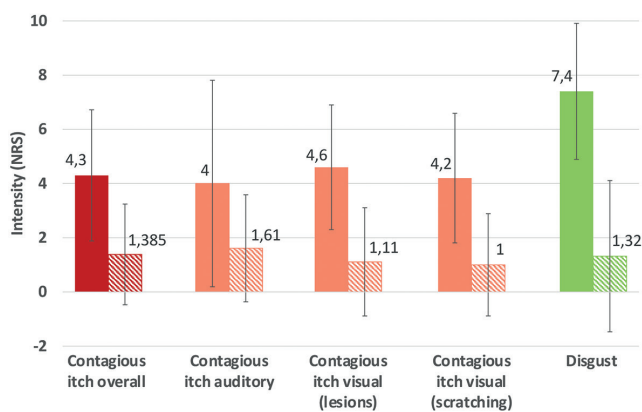


Fig. 1. Prevalence (%) and mean intensity (0–10 numerical rating scale) of itch, disgust and empathy (staff: red, family: yellow).



**Fig. 2. Intensity of contagious itch (CI) and disgust in the staff and infested family.** Fully coloured bars: family members ( $n=5$ ); hatched bars: staff ( $n=19$ ). Auditory: CI experienced when talking with infested family members about scabies. Visual (lesions): CI experienced when seeing scabies lesions. Visual (scratching): CI experienced when seeing infested family members scratching themselves. Disgust: disgust experienced when talking about scabies, seeing scabies lesions or family members scratching.

Although the mean “general” level of empathy (independent of scabies) as measured by the SPQ was very similar between the staff ( $3.3 \pm 0.5$ ) and family ( $3.3 \pm 0.2$ ), the level of scabies-related empathy with the family was twice as intense within the family members themselves ( $9.4 \pm 1.3$ ) as compared with the staff ( $4.3 \pm 3.0$ ).

## DISCUSSION

This exploratory study investigated the relationship between CI, disgust and empathy in an inpatient setting with a family infested with scabies and their treating medical staff. The intensity of CI, disgust and scabies-related empathy was very high within the family. In contrast, the intensity (and prevalence) of CI, disgust and empathy experienced by the staff was considerably lower, possibly reflecting a trained professional distance.

There is limited and inconclusive data available on the relationship between empathy and CI: while Lloyd et al. (8) found a positive correlation between the participants’ CI and the presumed itch intensity of others, Holle et al. (5) reported that the degree of itch contagion in a functional magnetic resonance imaging (fMRI) study was related to neuroticism but not empathy.

Schut et al. (6) hypothesized that CI and empathy may be linked through activation of the precuneus. This brain structure is involved in CI, the processing of histaminergic and non-histaminergic itch pathways, memory recapture and empathic judgements (9–11). The mirror neurone system, a network of specialized neurones that “mirror” actions and behaviour of others, might be another neurofunctional link, as this system is thought to be involved both in CI (Brodmann area 2, 6, 44) and in mediating empathy (1, 5, 12). As the sample size of the family was too small and we only found weak indications limited to the staff (CI and empathy (measured

**Table 1. The relationship between contagious itch, disgust and empathy in the medical staff ( $n=19$ ) treating a scabies-infested family**

	Disgust Spearman’s rho ( $p$ -value)	Empathy Spearman’s rho ( $p$ -value)
Contagious itch	0.79 ( $p=0.76$ )	Measured by SPQ: 0.35 ( $p=0.18$ ) Measured by empathy-NRS: 0.17 ( $p=0.51$ )
Disgust	N/A	Measured by SPQ: 0.05 ( $p=0.84$ ) Measured by empathy-NRS: $-0.13$ ( $p=0.61$ )

Spearman’s correlations coefficients ( $p$ -value). N/A: not applicable; SPQ: Saarbrücken Personality Questionnaire (SPQ); NRS: numerical rating scale.

by SPQ) Spearman’s rho 0.35,  $p=0.18$ ), our data cannot corroborate a link between CI and empathy.

The intensity of CI and scabies-related disgust in the family was notable: scabies-related baseline itch intensity was approximately doubled by CI. This indicates that CI contributes to the burden of disease in these patients. Likewise, intense disgust with one’s own family members might enhance the negative impact on wellbeing and stress level of an infested family. It is also possible that both CI and disgust play a role in the protracted post-scabetic itch, a particular challenge in clinical practice. From an evolutionary point of view, CI and disgust may be co-activated complementary strategies of the behavioural immune system: CI is aimed at scraping off ectoparasites, disgust at preventing ingestion of potential pathogens (3, 13). The positive correlation we observed in the staff (Spearman’s rho 0.79, potentially not statistically significant due to small sample size) may support this hypothesis.

Patient education about the phenomenon of CI had a beneficiary effect on 2 aspects of the disease: the family gained awareness that scratching or talking about itch and scabies in front of other family members could trigger or enhance their itch. They could also be assured that persistent itch was due to CI (and post-scabetic eczema) rather than treatment failure.

Visual cues may not only induce itch, but could also be harnessed to relieve it. For example, our group has demonstrated that visual exposure to subjective antipruritic colours reduces itch in various conditions (14, 15). However, we have not yet studied this application in patients with scabies.

The generalizability of these results is limited, due to the small sample size, institutional factors (team dynamics, level of training), familial factors (age distribution, time spent together, emotional relationships) and lack of objectification of the subjective perceptions itch, disgust and empathy. Larger studies are needed to confirm these findings and to assess potential therapeutic use by targeting CI and disgust in households with several patients with scabies. In addition to patient education, which proved helpful in our patients, scratching habit reversal, spatial separation of infested patients or counter-stimulation by visual cues (14) could be possible modalities to target CI in patients with scabies.

The authors have no conflicts of interest to declare.

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