
Microbial Causes of Paronychia

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ABSTRACT

Background and Objectives: Paronychia is inflammation of the skin that surrounds a fingernail or toenail. It may be acute or chronic and is most commonly caused by infection with either bacteria or fungi.

Methods: this paper will look for the possible bacteria and/or fungi that cause Paronychia; 112 Patients with paronychia were subjected to questionnaire; cultures were done for swabs from pus or discharge, and the cultivated microorganisms were further identified by biochemical methods. Control group, age and sex matched with patient group, subjected to the same questionnaire. Nasal swabs were taken from both groups for bacterial culture and identification.

Results: *staphylococcus aureus*, *candida albicans*, *klebsiella*, and *streptococcus pyogenes* are the only microorganisms identified, of which *staphylococcus aureus* is the most frequent one. There is a significant association between Staphylococcal nasal carries and paronychia, though all other parameters including age, sex, occupation, residency, marital status, and exposure to wetness, and family history showed a non-significant association as predisposing factors. Some of infections were unilateral, while others were bilateral. The infection might involve only one finger or toe, or it might involve more than one location. There is a significant association between *klebsiella* infection with chronicity and disfigurement of nail.

Conclusions: factors including repeated exposure to wetness, occupation, history of local trauma, and family history of paronychia are not significant risk factors in etiology of paronychia, while persons who are nasal carriers for *Staphylococcus aureus* might represent a risk factor for paronychia. *Staphylococcus aureus* is the most common causative agent of paronychia, though other microorganisms might be implicated as causative agents. Infections due to *klebsiella* species tend to be chronic and complicated by disfigurement of nails. There is surprisingly no children involvement by paronychia which should further studied.

Key words: Paronychia, etiology, bacteria, risk factors.

INTRODUCTION:

Paronychia is inflammation of the skin that surrounds a fingernail or toenail. It may be acute or chronic and is most commonly caused by infection with either bacteria or fungi. Paronychia occurs when a bacteria or fungus enters damaged skin surrounding the nail^{1,2}. The damaged skin can be torn cuticles, cuts, or cracks³. The risk of paronychia increases with diabetes mellitus, work that requires frequent

chemical solvents or water (examples: food service, cleaning, dentistry, bartending, hairdressing, and nursing), habitual nail-biting, and over aggressive manicuring⁴. The symptoms include redness and swelling of the skin around the nail, pus formation near the nail, pain and tenderness on touch, discoloration and ridging of the nail, and absence of the cuticle⁵. The diagnosis of paronychia depends on clinical features, and microbial culture of pus or discharge that is used to

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microorganism and for antibiotic sensitivity testing. Antibacterial drugs, antifungal drugs, or drainage of abscess might be used for treatment of paronychia; avoidance any irritant substance is also important. Symptoms may subside with treatment. However, permanent damage to the nail or surrounding tissue sometimes results^{6,7}.

Aim of study

This study is designated to look for the possible microbial causes of paronychia using direct microscopical examination of the pus associated with paronychia and microbial culturing methods for the pus. Some parameters will also be studied as possible predisposing factors.

PATIENTS AND METHODS:

This study was performed in Saif-Aldin Health Center in Suleimani City. This center includes the major public dermatological sector in the city. The type of this study is case-control study; patients group was those with paronychia whom diagnosed by the dermatologist, as having paronychia; the number of them was 112 patients and they were selected by random sampling method. A signed consent was taken from each patient in this study. A control group, age and sex matched with patient group, is involved in this study. Both groups were subjected to questionnaire, which included demographical data, the possible risk factors, and the site of infection. Direct microscopical examination of the pus or discharge (with and without gram stain) from the site of inflammation was performed. The specimen was also subjected to culture using blood agar, and MacConky agar, then bacterial identification was done. Nasal swab was taken from both groups and subjected to bacterial culture and identification.

Statistical analysis: The data were tested by Chi square test to measure any variations across groups along with corresponding 95% confidence intervals

RESULT:

The number of patients group was 112 (69 females and 43 male), their age ranged between (19 – 60 years) with mean age 49. The control group was age and sex matched with patients group. The age group of highest incidence is 20 – 29, as seen in figure (Figure 1). Regarding occupations, 26 of patients were housewives, 20 were employees, 26 were students, 15 were drivers, 15 were handworkers and 13 were with other occupations, this result was statistically not significant when compared to control group ($P>0.05$). The results showed that 92 (82.14%) of them in center of Suleimany (urban areas) and 20 (17.85%) of patients live in rural areas. The result was statistically not significant ($P>0.05$) when compared to control group. The marital status was estimated and the results showed that 33 (29.46%) of patients were single, while 79 were married, and the result was not statistically significant ($P>0.05$). The results revealed that only 19 of patients have history of chronic diseases and the result was statistically not significant when compared to control group. In this study 99 (88.39%) of patients have no family histories of paronychia, while the other 13 (11.6%) patients have positive family history of paronychia. Such proportions were not significantly different when compared to those in control group ($P>0.05$), (Table 1). Few of the patients (7%) have history of trauma before the appearance of paronychia's symptoms and signs, and this result was statistically not significant when compared with control group (6%). The frequent exposure to wetness was found in only 40 (35.71%) of patients, while the rest 72 (64.28%) patients have no such history, and this result was not significant when compared with the control group ($P>0.05$), this is clarified in (Figure 2). Culture of pus followed by microbial identification revealed that the following microorganisms were cultivated: *Staphylococcus aureus*,

klebsella

pneumoniae, *Streptococcus pyogenes*, and *Candida albicans* in frequencies of 84, 9, 5, and 22 respectively. As described in (Figure 3). The results revealed that 79 (70.53%) of patients have single microbial infection, while the other 33 (29.47 %) has mixed microbial infection. The results revealed that bacteria are associated with paronychia and its acute infection more than fungi, as demonstrated in (Table 2). The results demonstrated that paronychia was affecting only thumb, only toe, or more than one finger and/or toe, in a frequency of 52, 33, 18, and 9 respectively as shown in (Figure 4). Laterality of infection was estimated and the result showed that 62 (55.35%) of patients have a bilateral paronychia and the other 50 (44.64%) patients have unilateral paronychia. Most of patients (80.5 %) have either hands or feet involvement while the reminder (19.5%) have simultaneously, hand and foot paronychia. In this study, 64 (57.14%) of patients have symptoms and signs of acute inflammation, 48 (42.86%) of them have features of chronic infections (repeated infections for long duration and / or disfigurements). The results of nasal swab cultures from both groups for detection of *Staphylococcus aureus* nasal carriers showed significant statistical differences between patients group and control group (Figure 5), thus 46 of patients were carrier for *Staphylococcus aureus* and only nine persons of control group were carrier for this bacterium. Most of those patients (84%), who were nasal carrier for *Staphylococcus aureus*, were having the bacteria in the pus of sites affected with paronychia, and the result was significant ($P < 0.05$). Most of patients who are infected with *Klebsiella* showed chronicity (88.88%) of infection and complicated with disfigurement (77.77%), while disfigurements caused by *Candida albicans*, *staphylococcus aureus*, and *streptococcus* were 36.4%, 11.2%, and 0% respectively.

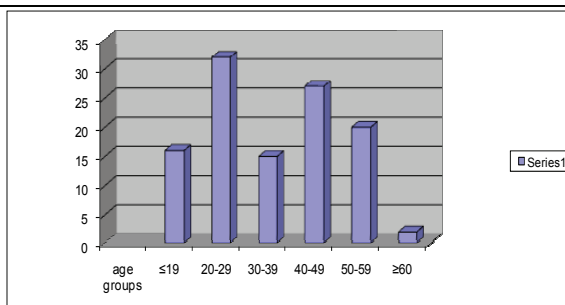


Figure 1: Frequency of paronychia among patients according to their age groups.

Table 1: Number of patients and control groups according to family history of paronychia.

Family history	Patient group	Control group
Positive	13	11
Negative	99	101
Total	112	112

$\chi^2 = 0.261$, ($P > 0.05$).

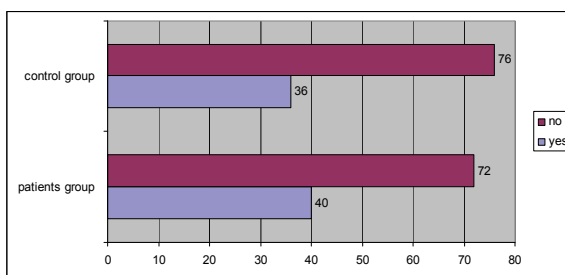


Figure 2: Frequency of exposure to wetness in patients and control groups

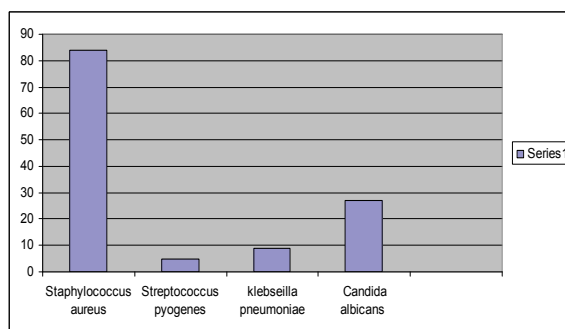


Figure 3: Microorganisms identified by culture of pus from sites affected by paronychia.

Table 2: the frequency of bacteria and fungi with acute and chronic infections.

	Only bacteria	Only fungi	Bacteria and fungi
Acute infection	58	0	6
Chronic infection	32	5	11

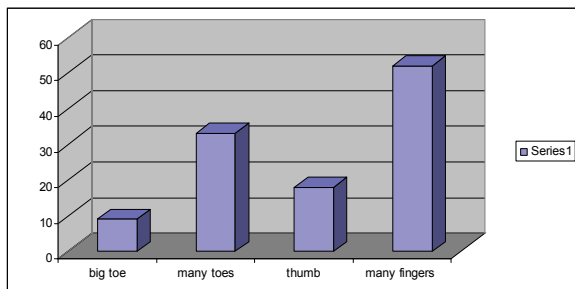


Figure 4: The frequency of paronychia according to site of infection.

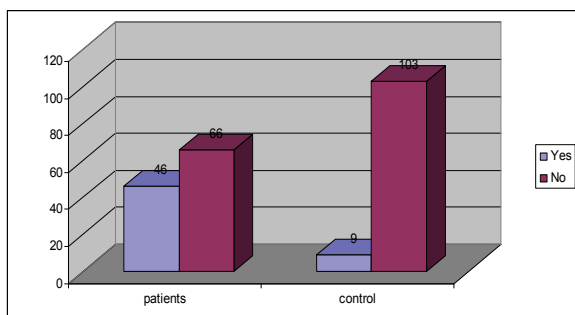


Figure 5: *Staphylococcus aureus* nasal carriers among patients and control groups

DISCUSSION :

In this study all the patients were adults and these results, surprisingly, showed absence of children involvement, which might reflect the rare occurrence of paronychia in Suleimany city due to good childhood hygiene, though many other studies, all over the world, showed that paronychia is not uncommon in children^{5,8}. The higher percentage of involvement in female than male is in accordance with results of another study⁹, and this may reveal the physiological differences as well

Nevertheless, there was no significant statistical differences regarding many risk factors proposed to predispose to paronychia and these include repeated exposure to wetness, occupation, family history of paronychia, and history of local trauma, and some of these results were against those by Roberge RJ, et al. who found that minor trauma and manicuring predispose to acute paronychia¹⁰. These risk factors might not be necessary for establishing paronychia and their effects might affect the type onset of disease, progression of disease, response to treatment, and/or chronicity. In this study only four microorganisms were identified, though many other studies identified more diverse groups of microorganisms including aerobic bacteria, anaerobic bacteria, and viruses^{11, 12} and this might reflect the need of applying more diverse culturing conditions, and advanced virological diagnostic methods; nevertheless most of studies showed results similar to ours regarding the presence of staphylococcus aureus in paronychia as the major causative pathogen¹³. Both acute and chronic paronychia are found in this study in closely related numbers, and the presence of two types might in part reflect the microbial cause as fungal infection herald chronic infection, also the type and duration of treatment may affect chronicity. Rigopoulos D, et al. thought that main factor associated with the development of acute paronychia is direct or indirect trauma to the cuticle or nail fold¹. The significant differences between patients group and control group regarding staphylococcal nasal carriers might be, either an important, unnoticed risk factor for developing *staphylococcus aureus* paronychia or nasal carriers might result from paronychia itself. In this study, there was an association between paronychia with klebsiella infection and local digital disfigurement and the relationship between these two conditions is not well understood, but appears to exist.

CONCLUSION:

Factors that include repeated exposure to wetness, occupation, history of local trauma, and family history of paronychia are not significant risk factors in etiology of paronychia, while persons who are nasal carriers for *Staphylococcus aureus* might represent a risk factor for paronychia. *Staphylococcus aureus* is the most common causative agent of paronychia, though other microorganisms might be implicated as causative agents. Infections due to *klebsiella* species tend to be chronic and complicated by disfigurement of nails. There is surprisingly no children involvement by paronychia which should

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