

## Efficacy of microwave therapy in the treatment of viral warts: A cross-sectional study from Saudi Arabia

Microwave therapy in the treatment of viral warts

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### Abstract

**Aim:** Microwave therapy has emerged as a promising treatment modality for viral warts, showing potential in improving treatment outcomes. Therefore, this study evaluated the safety and efficacy of microwave therapy in the treatment of viral warts.

**Materials and Methods:** A cross-sectional study was conducted at Alkhibrah Medical Complex in Arar, Saudi Arabia. The study enrolled patients presenting with viral warts and treated with microwave therapy. Data was collected using a standardized data collection form, including age, gender, wart characteristics (size, location, number), treatment response, and recurrence.

**Results:** A total of 30 patients were included in the study. The participants' ages ranged from 6 months to 45 years. Female participants were 16 (53.3%), while 14 (46.7%) were male. The most common anatomical locations of warts were the hands (40.0%). Microwave therapy led to complete wart eradication of 22 patients (73.3%). The number of sessions received by the enrolled cases till successful eradication varied between 2 and 5 sessions. Follow-up data revealed recurrence among only 4 patients (18.2%). There was no effect of the demographic and clinical characteristics on the outcomes and recurrence data.

**Discussion:** Microwave therapy represents a highly effective and convenient option for wart management, particularly for single warts. However, higher recurrence rates in multiple warts underscore the need for further optimization of treatment protocols. Future research should focus on addressing the limitations identified in this study, including the development of standardized protocols and comparative trials.

### Keywords

Warts, Microwave Therapy, Human Papillomavirus, Warts Recurrence.

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## Introduction

Viral warts, caused by human papillomavirus (HPV) infection, are a common dermatological condition affecting individuals of all ages. Despite the availability of various treatment modalities, achieving complete and long-lasting clearance of warts remains a challenge [1]. Current treatment modalities include topical salicylic acid, cryotherapy, topical immunotherapy, and cantharidin [2]. Microwave therapy has emerged as a promising treatment modality for viral warts, showing potential in improving treatment outcomes [2].

Recent studies have provided valuable insights into the efficacy and safety of microwave therapy in the management of viral warts. However, there is a lack of data specifically evaluating its use in the Saudi Arabian population. Therefore, this proposal aims to conduct a cross-sectional study at Alkhibrah Medical Complex in Arar, Saudi Arabia, to evaluate the safety and efficacy of microwave therapy in the treatment of viral warts.

Microwave therapy, which utilizes high-frequency electromagnetic waves to heat and destroy abnormal tissue, has shown promise in the treatment of HPV-related conditions. The mechanism of action of microwave therapy in the context of HPV-related conditions is believed to be the generation of thermal energy, which induces cell death and tissue destruction, ultimately eliminating the HPV-infected cells [3]. This approach has been explored as a treatment for various HPV-related conditions, including genital warts, cervical dysplasia, and certain types of HPV-associated cancers.

Several studies have investigated the efficacy and safety of microwave therapy for the management of HPV-related conditions. A systematic review and meta-analysis conducted by Zhang et al. [4] aimed to evaluate the effectiveness of microwave therapy for the treatment of genital warts. The authors reviewed 17 studies involving a total of 1,362 patients and found that microwave therapy had a high overall effective rate, with a pooled clearance rate of 89.1%. The review also indicated that microwave therapy was associated with a relatively low recurrence rate and a good safety profile, with few reported adverse events.

Another study by Zhao et al. [5] focused on the use of microwave therapy for the treatment of cervical intraepithelial neoplasia (CIN), a precancerous condition of the cervix often associated with HPV infection. The study reported that microwave therapy was effective in treating CIN, with a complete response rate of 92.1% and a low recurrence rate of 8.2% during the follow-up period.

In a study conducted by Peng et al. [6], researchers investigated the efficacy of microwave therapy for the treatment of HPV-associated anal intraepithelial neoplasia (AIN). The study demonstrated that microwave therapy was an effective and safe treatment option, with a complete response rate of 86.7% and a low recurrence rate of 13.3% over the follow-up period.

Furthermore, a review by Xu et al. [7] examined the use of microwave therapy for the treatment of HPV-associated head and neck cancers. The review reported promising results, suggesting that microwave therapy holds potential as a minimally invasive and effective treatment option for these types of cancers.

In conclusion, the existing literature suggests that microwave

therapy is a promising treatment modality for various HPV-related conditions, including genital warts, cervical dysplasia, and HPV-associated cancers. The available evidence indicates that microwave therapy is generally effective, with relatively low recurrence rates and a good safety profile. However, further research is still needed to fully understand the long-term efficacy and safety of this approach, as well as to optimize treatment protocols and identify the most suitable patient populations for microwave therapy. Hence, the current study was conducted to assess the efficacy of microwave therapy in achieving complete clearance of viral warts with an evaluation of the safety profile of microwave therapy in the Saudi population. In addition, the potential factors that may affect the therapy outcomes will be studied.

## Materials and Methods

### Study Design

This project was conducted as a cross-sectional study at Alkhibrah Medical Complex in Arar, Saudi Arabia. The study will span from July 2024 to December 2024. The study included all patients from different age groups presenting with viral warts at the dermatology clinic of the Medical Complex. The sample size was determined based on the prevalence of viral warts and the expected response rate to microwave therapy. A power analysis was conducted to ensure an adequate sample size to achieve statistically significant results.

Data were collected using a standardized data collection form. The following variables will be recorded: age, gender, wart characteristics (size, location, number), previous treatments, treatment response, adverse events, and follow-up duration. Patients underwent microwave therapy for the treatment of viral warts. The microwave therapy protocol was standardized and administered by trained healthcare professionals following established guidelines.

### Statistical Analysis

Descriptive statistics were used to summarize patient demographics and wart characteristics. The treatment response rate was calculated as the proportion of patients achieving complete clearance of warts. Factors associated with treatment response and adverse events were analyzed using Exact Fisher tests, which help get exact p-values with small-sized study groups.

### Ethical Approval

This study was approved by the Local committee of bioethics, Northern Border University (Date: 2024-6-25, No: 89/24/H).

## Results

After informed consenting, 30 patients were enrolled in the study with varying ages, genders, wart locations, and numbers. The demographic data and wart characteristics of the participants are shown in Table 1. The participants' ages ranged from 6 months to 45 years ( $15.8 \pm 9.5$  years). Females were 16 (53.3%), while 14 (46.7%) were male. The anatomical locations of warts in the enrolled patients were variable. The commonest location was the hands (40.0%), followed by the feet (23.3%). Multiple warts were more common and observed in 20 cases (66.7%) (Table 1).

Microwave therapy was applied in all cases through the

standardized approach. Complete wart eradication was shown in 22 patients (73.3%), while in 8 patients (26.7%), there was no observed significant eradication. The number of sessions received by the enrolled cases till successful eradication varied between 2 and 5 sessions. Follow-up data revealed recurrence among only 4 patients (18.2%) (Table 2). There was no effect of the demographic and clinical characteristics on the outcomes and recurrence data (Tables 3 and 4).

## Discussion

The current study was conducted to assess the efficacy of microwave therapy in achieving complete clearance of viral warts with an evaluation of the safety profile of microwave therapy in the Saudi population. In addition, the potential factors that may affect the therapy outcomes were studied. The study outcomes show that microwave therapy is an effective modality for treating warts. The enrolled cases showed a high eradication rate with relatively low recurrence among successfully treated cases. These outcomes agree with earlier published data, which recommended the application of microwave therapy for the localized immune lesions of dermatological diseases [1, 8, 9]. This recommendation was based on the capability of the thermal effect of microwave therapy to enhance immune surveillance as well as targeting the infected tissues, which is expected to be efficient in the management of HPV induced warts. Patients with single warts demonstrated a notably better eradication rate than patients with multiple warts, which is consistent with previously published data, which highlight multiple warts as a real challenge with the different effective treatment modalities with lower eradication rates and higher levels of recurrence [10, 11].

In cases of single wart lesion, recurrence was also observed in lower rates, which highlights the complexity of the treatment outcomes as multiple variables may contribute to immune status, viral load, and wart depth [12]. In addition, wart locations such as genital and subungual wart microwave therapy outcomes highlight the importance of tailored therapeutic strategies for these challenging locations [13].

There was no statistically significant effect of the participant's age or gender, and the others studied clinical features of warts on the treatment outcomes and eradication rates. This finding suggests that microwave therapy can be broadly recommended across diverse demographic groups. However, higher recurrence rates were shown in multiple warts cases, which signifies the importance of adjunctive treatments with modalities, such as cryotherapy and immunotherapy, for cases with multiple warts with the need for longer durations of follow-up [14-17].

## Limitation

The study provides clinical evidence about the efficacy of microwave therapy in the management of warts; however, this study has its limitations. Small-sized sample, with two months short follow-up duration, absence of other groups with the conventional modalities for comparison with microwave therapy data, in addition to being a single center study can limit the findings generalizability. Also, the variations in patient adherence and personal characteristics of the immune responses could bias the results. Hence, Further studies

are recommended to address these limitations for a more comprehensive assessment for microwave therapy in wart management.

## Conclusion

In conclusion, based on the current results, microwave therapy can be considered a highly effective modality for wart management, especially for cases with single warts in hands and other accessible locations. Cases with multiple warts mostly require combined treatment with other modalities such as cryotherapy and immunotherapy with further optimization of treatment protocols. Further studies are recommended to address the studied limitations considered for a more comprehensive assessment for microwave therapy in wart management to improve patient outcomes.

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## Scientific Responsibility Statement

The authors declare that they are responsible for the article's scientific content including study design, data collection, analysis and interpretation, writing, some of the main line, or all of the preparation and scientific review of the contents and approval of the final version of the article.

## Animal and Human Rights Statement

All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

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## Conflict of Interest

The authors declare that there is no conflict of interest.

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