RESEARCH PAPER

Boric Acid Powder versus Povidone-Iodine Solution for Otomycosis: A Randomized Clinical Trial

Mohamed Abdallah Saad Abdelwahab [1]*, Wael Shehata Mohamed [2], Wael Aly Al-Zamil [3], Raed Mohamed Abdellatife [2]

[1] Otorhinolaryngology Department, Nasser Institute Hospital, Cairo, Egypt
[2] Otorhinolaryngology Department, Faculty of Medicine, October 6th University, Cairo, Egypt
[3] Otorhinolaryngology Department, Hearing and Speech Institute Hospital, Giza, Egypt

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ABSTRACT

Background: Boric acid (BA) and iodine are frequently utilized as topical antiseptics. BA is particularly effective in otomycosis due to its antimicrobial and acidic properties, while iodine is widely used as a broad-spectrum antiseptic because of its strong antibacterial activity. The aim of this work was to compare the efficacy, related endpoints as recurrence and side effects of topical BAP and PVP-I solution in the treatment of otomycosis.

Methods: This RCT enrolled 100 participants from 18 to 60 years with otomycosis, divided equally into two groups (Gs). G A had BAP after ear cleaning, while G B had 10% PVP-I ear drops once daily for one week.

Results: Day 7 response and day 14 response were significantly in G A versus G B (P<0.05). Treatment resistant day 20 were significantly reduced in G A versus G B (P=0.007). Week 4 recurrence eligibility was significantly elevated in G A versus G B (P=0.005). Week 4 recurrence after day 14 and response was significantly reduced in G A than G B (P<0.05). Any side effect was insignificantly different among both Gs.

Conclusions: Topical BAP is more effective than 10% PVP-I solution in the management of otomycosis following meticulous aural toilet. BAP is a safe and effective first-line topical treatment for uncomplicated otomycosis and may provide superior clinical endpoints related with 10% PVP-I solution.

Keywords: Boric Acid Powder, Povidone-Iodine Solution, Otomycosis

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INTRODUCTION

The external ear comprises the auricle and the external auditory canal (EAC), which is anatomically divided into two segments. The lateral one-third consists primarily of cartilage, whereas the medial two-thirds are osseous. The principal function of the EAC is to transmit sound waves as mechanical vibrations to the tympanic membrane (TM). [1].

The EAC is about 4 cm in length, extending from the tragus to the TM, and follows an S-shaped course. Its lateral segment is directed anterosuperiorly, whereas the medial segment courses posteriorly. The outer one-third is cartilaginous and lined by skin that is continuous with the skin of the auricle. [2].

The EAC contains two anatomical constrictions: one at the lateral end of the cartilaginous segment and another, representing the narrowest point, at the isthmus of the osseous segment. Anteriorly, the EAC is closely related to the temporomandibular joint and the parotid gland. Posteriorly, it is separated from the mastoid air cells by a very thin bony plate, which may permit the spread of infection from the mastoid to the subperiosteal tissues. [2].

The auricle receives its arterial blood supply from the superficial temporal artery anteriorly, particularly toward the tragus, and the posterior auricular artery posteriorly, toward the lateral helix. Both arteries arise from the external carotid artery. [3].

Sensory innervation of the external ear is provided by both cranial and spinal nerves. The cranial contribution arises from branches of the trigeminal, facial, and vagus nerves (CN V, VII, and X), whereas the spinal component is supplied primarily by the lesser occipital and greater auricular nerves, which originate from the C2–C3 cervical nerve roots. [3].

The aim of this work was to compare the efficacy, related endpoints as recurrence and side effects of topical boric acid powder (BAP) and povidone-Iodine (PVP-I) Solution in the treatment of otomycosis.

PATIENTS AND METHODS:

This randomized clinical trial was executed on 100 participants from 18 to 60 years, both genders, diagnosed with Otomycosis. The study was executed after authorization from the Ethical Committee 6th University hospital, Cairo, Egypt. A documented form was gathered from the participants.

Exclusion criteria were TM perforation, concurrent immunosuppression (e.g., acquired immunodeficiency

**Author for Correspondence: Mohamed Abdallah Saad Abdelwahab*

syndrome or treatment with cytotoxic or immunosuppressive agents), and concomitant bacterial infection, individuals with a record of ear discharge (any type) before the current illness and open mastoid cavity or ear surgery, diabetics, and hearing aid bearers.

Participants were located into two equal groups(Gs): G A: had BAP applied into EAC after cleaning, with the powder left in place for one week. G B: had 10% PVP-I ear drops, with participants advised to instill three drops into EAC once daily for one week following the initial cleaning.

All participants underwent a comprehensive history taking and physical examination (General and local examination).

Treatment regimen:

All participants underwent aural toilet (suction and cleaning) to remove fungal debris from EAC. This step ensures direct contact of the medication with the affected area.

G A: BA G

Participants in this G had BAP as the main therapy. After ear cleaning, BAP was applied into EAC. The powder was remained inside the canal for one week without removal. Participants were advised to maintain the ears in a dry condition and avoid water exposure for the duration of treatment.

G B: PVP-I G

Participants in this G were treated with PVP-I 10% solution in the form of ear drops. After initial cleaning during the first visit, participants were advised to instill three drops into EAC once daily (every 24 hours) for one weak. Participants were advised to maintain the ears in a dry condition and avoid water exposure for the duration of treatment.

Follow-up schedule for both Gs: Day 0 (Baseline): Aural toilet and initiation of treatment, day 7: Clinical assessment and examination of EAC, day 14: Final evaluation for clinical endpoint and week 4: Follow-up visit to check for recurrence.

Assessment of endpoints:

Grounded on their clinical response to treatment, participants were placed into three Gs: excellent responders, known by a dry EAC and TM with no discharge; partial responders, known by minimal discharge with persistent moisture; and non-responders, known by persistent or excessive secretion from the EAC. Treatment was discontinued once a complete clinical response was reached; otherwise, it was continued. Participants who failed to demonstrate a response by day 20 were considered treatment-resistant.

Endpoint measurements and follow-up

The clinical endpoints were assessed based on the patient's response to treatment as follows:

Excellent response: Complete resolution of symptoms with a dry EAC and TM, and no secretion. Partial response: Slight discharge or residual moistness of EAC but not completely dry. No response: Persistent otorrhea, hypersecretion, or visible fungal elements in the canal. All participants were examined clinically in the outpatient clinic using otoendoscopy to assess the condition of EAC and TM and to determine the treatment endpoint objectively. Participants achieving a full (excellent) response were had their treatment discontinued. Those with partial or no response were continued therapy and be reassessed weekly. Cases that show no improvement by day 20 were considered treatment resistant.

The primary endpoint was to measure was the proportion of participants achieving an excellent response after 14 days of treatment. The secondary endpoint was to measure include recurrence rate and occurrence of any side effects during or after therapy.

Sample Size Calculation:

It was determined via the IBM[a] SPSS[a] Sample Power[a] version 3.0.1 (IBM[a] Corp., Armonk, NY, USA). A previous study executed by Xu et al. [4] documented that the rate of complete response after treatment of BA was 81.8 %. Thus, it was estimated that a least sample size of 50 cases is needed to reach a power of 80% to detect expected difference in the rate of complete response of 10%, at a significance level of 0.05. An equal number was assigned in the other G. So, the total number was 100 participants.

Statistical analysis

It was executed via SPSS v29 (IBM Inc., Chicago, IL, USA). Shapiro-Wilks test and histograms were utilized to determine the normality of the distribution of data. Quantitative parametric variables were shown as mean and standard deviation (SD) and related among the two Gs via unpaired Student's t- test. Quantitative non-parametric data were shown as median and interquartile range (IQR) and were analyzed via Mann Whitney-test. Qualitative variables were shown as frequency (%) and were analyzed via the Chi-square test or Fisher's exact test when appropriate. A two tailed P value ≤ 0.05 was considered statistically significant.

RESULTS:

One hundred-seven participants were examined for eligibility; four participants did not fulfil the criteria and three participants reject to participate in the study. The other participants were randomly placed into two equal Gs (50 participants in each). All participants were followed up and analyzed statistically. Figure 1

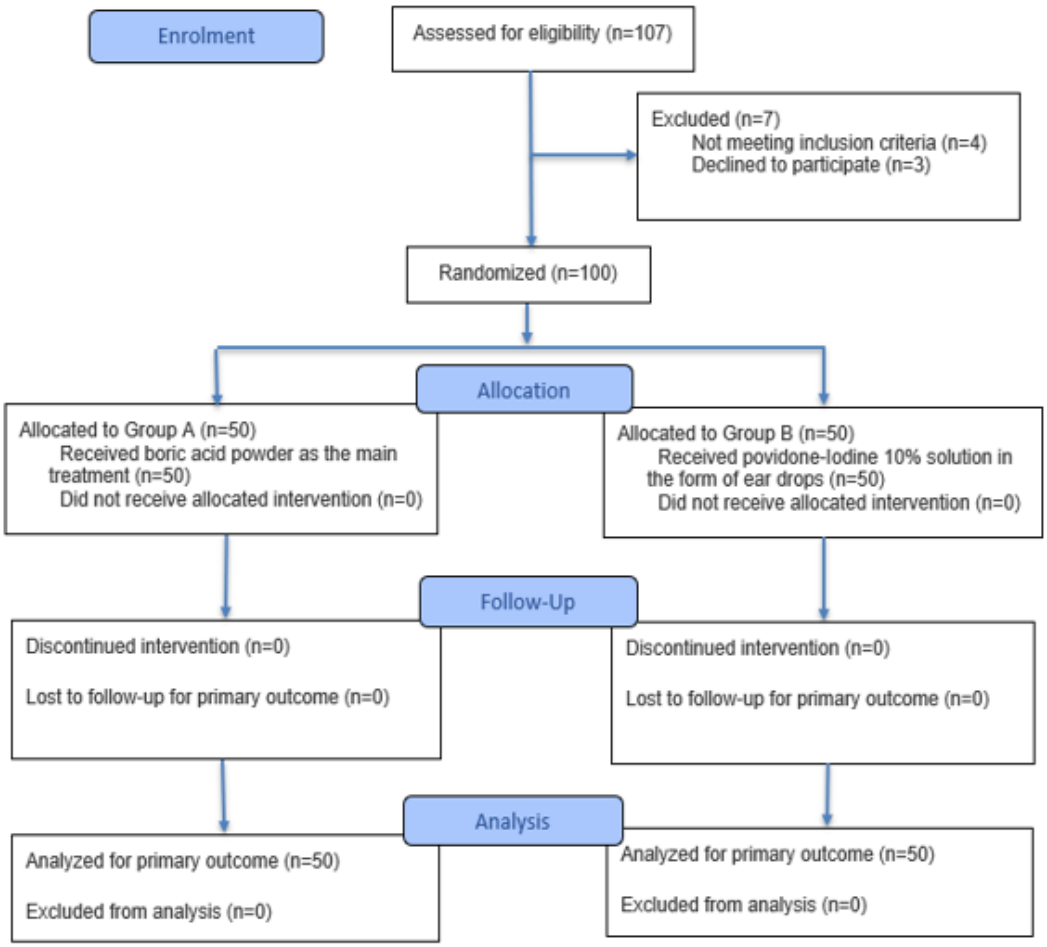

Figure 1: CONSORT flowchart of the enrolled participants

Age, sex, ear side and symptom duration, ear manipulation history, swimming history and prior topical drops current illness didn't differ significantly among both Gs. Table 1

Table 1: Demographic data and symptom duration and history data of the investigated Gs

		G A (n=50)	G B (n=50)	P	Mean difference/RR (95%CI)
Age (years)		34.74 ± 7.92	35.7 ± 8.4	0.558	-0.96(-4.2: 2.28)
Sex	**Male**	23 (46%)	22 (44%)	0.841	1.05(0.68:1.61)
	Female	27 (54%)	28 (56%)		
Ear side	**Right**	22 (44%)	23 (46%)	0.841	0.96(0.62:1.48)
	Left	28 (56%)	27 (54%)		
Symptom duration (days)		20.68 ± 8.64	20.86 ± 9.71	0.922	-0.18(-3.83: 3.47)
History data					
Ear manipulation history		21 (42%)	20 (40%)	0.839	1.05(0.66:1.68)
Swimming history		14 (28%)	13 (26%)	0.822	1.08(0.56:2.05)
Prior topical drops current illness		11 (22%)	10 (20%)	0.806	1.1(0.51:2.36)

Data are shown as mean ± SD or frequency (%). CI: Confidence interval, RR: Relative risk.

Baseline severity, pruritus, otalgia, otorrhea, ear fullness and hearing loss didn't differ significantly among both Gs. TM perforation, immunosuppression, concurrent bacterial infection, prior ear discharge history, ear surgery or open mastoid, diabetes and hearing aid user didn't occur in any participant in both Gs. Table 2

*Author for Correspondence: Mohamed Abdallah Saad Abdelwahab

Table 2: Baseline severity, clinical presentation and risk factors of the investigated Gs

		G A (n=50)	G B (n=50)	P	RR (95%CI)
Baseline severity	**Mild**	12 (24%)	13 (26%)	0.971	0.96(0.56:1.65)
	Moderate	27 (54%)	26 (52%)		
	Severe	11 (22%)	11 (22%)		
Pruritus		46 (92%)	45 (90%)	1	1.02(0.9:1.16)
Otalgia		31 (62%)	30 (60%)	0.838	1.03(0.76:1.41)
Otorrhea		44 (88%)	43 (86%)	0.766	1.02(0.88:1.19)
Ear fullness		31 (62%)	30 (60%)	0.838	1.03(0.76:1.41)
Hearing loss		26 (52%)	25 (50%)	0.841	1.04(0.71:1.53)
Risk factors					
TM perforation		0 (0%)	0 (0%)	---	
Immunosuppression		0 (0%)	0 (0%)	---	
Concurrent bacterial infection		0 (0%)	0 (0%)	---	
Prior ear discharge history		0 (0%)	0 (0%)	---	
Ear surgery or open mastoid		0 (0%)	0 (0%)	---	
Diabetes		0 (0%)	0 (0%)	---	
Hearing aid user		0 (0%)	0 (0%)	---	

Data are shown as frequency (%). CI: Confidence interval, RR: Relative risk.

Aural toilet on day 0 occurred in all participants 50 (100%). Day 7 response and day 14 response were significantly elevated in G A versus G B (P<0.05). Treatment resistant day 20 were significantly reduced in G A versus G B (P=0.007). Table 3

Table 3: Clinical endpoints of the investigated Gs

		G A (n=50)	G B (n=50)	P
Aural toilet day 0		50 (100%)	50 (100%)	--
Day 7 response	**Partial**	20 (40%)	16 (32%)	**0.001***
	Excellent	24 (48%)	12 (24%)	
	No response	6 (12%)	22 (44%)	
Day 14 response	**Partial**	8 (16%)	10 (20%)	**0.004***
	Excellent	39 (78%)	22 (44%)	
	No response	3 (6%)	18 (36%)	
Treatment resistant day 20		3 (6%)	10 (20%)	**0.007***

Data are shown as frequency (%). *Significant P value <0.05, CI: Confidence interval, RR: Relative risk.

Week 4 recurrence eligibility was significantly elevated in G A versus G B (P=0.005). Week 4 recurrence after day 14 and response was significantly reduced in G A versus G B (P<0.05). Any side effect didn't differ significantly among both Gs. Table 4

Table 4: Treatment endpoints of the investigated Gs

		G A (n=50)	G B (n=50)	P	MD/ RR (95%CI)
Week 4 recurrence eligibility	**Eligible**	39 (78%)	22 (44%)	**0.005***	1.77(1.25:2.5)
	Not eligible	11 (22%)	28 (56%)		
Week 4 recurrence after day 14		2 (4%)	21 (42%)	**<0.001***	0.44(0.24:0.83)
Response	**Day 7**	0 (0-0)	0 (0-0)	**0.003***	0 (0:0)
	Day 14	3 (2-4)	4 (3-5)	**0.004***	1 (0:2)
Any side effect		2 (4%)	4 (8%)	0.397	0.5(0.1:2.61)

Data are shown as frequency (%). *Significant P value <0.05, CI: Confidence interval, RR: Relative risk, MD: Median difference.

DISCUSSION

Otomycosis is a superficial fungal infection of EAC that accounts for about 7–30% of cases of otitis externa, particularly in tropical and subtropical regions characterized by high temperature and humidity [5].

The superior clinical endpoint observed with BAP may be attributed to its multiple mechanisms of action. BA lowers the pH of EAC, creating an acidic environment that inhibits the growth of common fungal pathogens as Aspergillus and Candida species. Furthermore, BAP possesses hygroscopic properties that absorb moisture from EAC, maintaining a dry environment that is unfavorable for fungal survival and proliferation. The powder formulation also remains in prolonged contact with the canal following meticulous aural toilet, providing sustained local antifungal activity and reducing the risk of persistent infection and recurrence [6,

*Author for Correspondence: Mohamed Abdallah Saad Abdelwahab

7]. In contrast, although PVP-I possesses broad-spectrum antiseptic activity against bacteria, fungi, and viruses, its antimicrobial effect is relatively short-lived because free iodine is rapidly consumed by organic material and diluted by canal secretions, requiring repeated application to maintain efficacy [8, 9]. Consequently, BA may achieve more sustained fungal suppression, resulting in faster clinical improvement, lower treatment resistance, and reduced recurrence, while maintaining a safety profile comparable to PVP-I. These mechanisms are consistent with previous studies demonstrating the effectiveness of BA in otomycosis and the comparatively lower efficacy of PVP-I when used as topical monotherapy [10]. This was harmony with Numchaichanakij and Kreesaeng [11] reported that there were 45 male participants and 48 female participants in the 10% PVP-I G. The age (mean ±SD) in 10% PVP-I was 47.7 ±18.33 years. In the second week after treatment, 37.64% of the 10% PVP-I G had a good response to treatment. In addition, Boolaky and Sandooram [12] showed that resolution of otomycosis in 77% of cases when treated with topical 4% BA in alcohol. Likewise, Haq and Deshmukh [13] revealed that 49.1% of participants having PVP-I had a partial response. Grounded on other investigations, the most frequent clinical symptom comprises pruritis/itching (74%) and otalgia (60%) then by a blocked sensation in the ear (50%); other symptoms involve hearing loss (44%), discharge (36%), tinnitus (8.9%), inflammation, otorrhea and scaling.

In the same context, Aziz et al. [14] highlighted that Otalgia was present in 4 (5.4%) PVP-I G and Pruritus was 3 (4%). 7.5% PVP-I is far effective in the treatment and management of otomycosis relative to 1% Clotrimazole eardrops and lignocaine.

In the present study, all participants underwent meticulous aural toilet before topical therapy, ensuring complete removal of fungal debris and necrotic material, thereby facilitating direct contact of the medication with the infected epithelium [15]. In addition, participants were instructed to keep the ear dry and avoid further trauma or water exposure throughout the treatment period. These adjunctive measures are considered essential components of successful otomycosis management and have consistently been recommended in the literature because they reduce fungal burden, improve penetration of topical agents, accelerate healing, and decrease recurrence rates [13]. Beyond otomycosis, BA has also been successfully used in the management of otitis externa owing to its acidifying, antiseptic, and drying properties, and has been reported to promote resolution of inflammatory granulation tissue within EAC by creating an environment unfavorable for microbial growth and excessive tissue proliferation [16]. Therefore, the superior endpoints achieved with BAP in our study likely reflect the combined effect of its pharmacological properties together with meticulous aural toilet and appropriate ear care measures rather than the topical agent alone [13].

Limitations of the study were that the sample size was dimensioned. The study was in a single center. The follow-up period was limited to four weeks, which may not have been sufficient to detect late recurrences or delayed adverse effects. Only individuals with uncomplicated otomycosis were included, as individuals with TM perforation, diabetes, immunosuppression, previous ear surgery, and other comorbidities were excluded; therefore, the findings cannot be applied to this population.

CONCLUSIONS:

Topical BAP is more effective than 10% PVP-I solution in the treatment of otomycosis following meticulous aural toilet. BAP achieved significantly higher clinical response rates at days 7 and 14, lower treatment resistance at day 20, and a lower recurrence rate at week 4, while maintaining a safety profile comparable to PVP-I. BAP is a safe and effective first-line topical treatment for uncomplicated otomycosis and may provide superior clinical endpoints related with 10% PVP-I solution.

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REFERENCES

1. Chatra PS. Lesions in the external auditory canal. Indian J Radiol Imaging. 2011; 21:274-8.
2. Niekrash CE. Anatomy of the External Ear. Applied Head and Neck Anatomy for the Facial Cosmetic Surgeon: Springer; 2020. p. 85-9.
3. Fagni N, Valli L, Nittari G, Procelli G, Branca JJV, Cuomo R, et al. Superficial temporal artery: anatomical variation and its clinical significance. J Vasc Dis. 2025; 4:14-20.
4. Xu S, Li J, Ding L, Gao K, Xie F, Han J, et al. Efficacy and safety of terbinafine hydrochloride spray and 3% boric acid alcohol ear drops in otomycosis. Acta Otolaryngol. 2020; 140:302-6.
5. Bojanović M, Stalević M, Arsić-Arsenijević V, Ignjatović A, Ranđelović M, Golubović M, et al. Etiology, predisposing factors, clinical features and diagnostic procedure of otomycosis: a literature review. J Fungi. 2023; 29:6-62.
6. Romsaithong S, Tomanakan K, Tangsawad W, Thanaviratananich S. Effectiveness of 3 per cent boric acid in 70 per cent alcohol versus 1 per cent clotrimazole solution in otomycosis patients: a randomised, controlled trial. J Laryngol Otol. 2016; 130:811-5.
7. De Seta F, Schmidt M, Vu B, Essmann M, Larsen B. Antifungal mechanisms supporting boric acid therapy of Candida vaginitis. J Antimicrob Chemother. 2009; 63:325-36.
8. Reimer K, Wichelhaus TA, Schäfer V, Rudolph P, Kramer A, Wutzler P, et al. Antimicrobial effectiveness of povidone-iodine and consequences for new application areas. Dermatol. 2002; 145:114-

20.
9. Lepelletier D, Maillard JY, Pozzetto B, Simon A. Povidone iodine: Properties, mechanisms of action, and role in infection control and staphylococcus aureus decolonization. Antimicrob Agents Chemother. 2020; 64:15-36.
10. Del Palacio A, Cuétara MS, López-Suso MJ, Amor E, Garau M. Randomized prospective comparative study: short-term treatment with ciclopiroxolamine (cream and solution) versus boric acid in the treatment of otomycosis. Mycoses. 2002; 45:317-28.
11. Numchaichanakij P, Kreesaeng P. Comparison of efficacy in the treatment of otomycosis using 10% povidone-iodine and clotrimazole solution: Randomized, double-blind control trial. Int Arch Otorhinolaryngol. 2025; 29:1-4.
12. Boolaky S, Sandooram D. Otomycosis-a review of current management trends. Int Arch Otorhinolaryngol. 2024; 178:12-6.
13. Haq M, Deshmukh P. Review of recurrent otomycosis and clotrimazole in its treatment. Cureus. 2022; 140:300-98.
14. Aziz T, Qureshi N, Khawaja M, Ulfat R, Muhammad T, Aziz AMT, et al. Comparison of effectiveness of 7.5% Povidone-iodine with 1% Clotrimazole ear drops and lignocaine in Otomycosis. J Rawalpindi Med Coll. 2020; 24:55-66.
15. Bhat P. Aerobic Bacterial and Fungal Profile of Chronic Suppurative Otitis Media and Its Antibiotic Susceptibility Pattern: Rajiv Gandhi University of Health Sciences (India); 2019.
16. Ellis J, De La Lis A, Rosen E, Simpson MTW, Beyea MM, Beyea JA. Approach to otitis externa. Can Fam Physician. 2024; 70:617-23.