Dermatology Practical & Conceptual

Supplementary Material

Table S1. Summary and baseline characteristics of the included studies.

N	Study ID	Study arms, n (%)	Site	Age, (mean ± SD) y	Male, n (%)	Follow-up duration (months)	Type of Warts, n (%)	Warts Duration (months), (mean ± SD)
1	**Abd El-Magid et.al 2019(1)**	**Vit. D3,** 20 (50)	Egypt	30.75±12.5	18(90)	Mean (Three)	Palmar, 20 (100)	9 ± 5.57
		Zinc Sulfate, 20 (50)		31.5±10.25	16(80)		Palmar, 20 (100)	7.75 ± 2.75
2	**Abou-Taleb et.al 2019(2)**	**Vit D3,** 23 (51.11)	Egypt	32.13±13.34	13(56.5)	Mean (Three)	1-Plantar, 10 (43.5) 2-Common, 9 (39.1) 3-Both, 4 (17.4)	18.96 ± 37.56
		PPD, 22 (48.89)		31.13±6.86	18(81.8)		1-Plantar, 12 (54.5) 2-Common, 4 (18.2) 3-Both, 6 (27.3)	20.28 ± 19.08
3	**Agrawal et.al 2018(3)**	**MMR,** 30 (50)	India	25±9.5	19(63.33)	Mean (Six)	1- Single wart 7 (23.33) 2-Multiple warts 23 (76.76) 3-Distant warts 23 (76.76)	12 to 36
		Placebo, 30 (50)		27±8.9	17(56.67)		1- Single wart 9 (30) 2-Multiple warts 21 (70) 3-Distant warts 14 (46.67)	12 to 36
4	**Awal et.al 2018(4)**	**MMR,** 72 (59.02)	India	28.9±9.4	40(55.55)	Mean (3.7)	1-Palmoplantar surface, 23 (31.9) 2-Upper extremities/dorsal of hands, 21 (29.1) 3-Lower extremities/ dorsal of feet, 16 (22.2) 4-Periungual area, 8 (11.1) 5-Face, 4 (5.5)	13.7 ± 9.5
		Placebo, 50 (40.98)		33.6±9.2	27(54)		1-Palmoplantar surface, 18 (36.0) 2-Upper extremities/dorsal of hands, 19 (38.0) 3-Lower extremities/ dorsal of feet, 9 (18.0) 4-Periungual area, 3 (6.0) 5-Face, 1 (2.0)	11.8 ± 7.0
5	**Dhakar et.al 2015(5)**	**Mw,** 33 (50)	India	Mean (22.8)	18(54.54)	Mean (3.7)	1-Palms 9 (27.27) 2-Soles 12 (36.36) 3-Multiple sites 12 (36.36)	<6 months, 23 (69.69%)
		Cryotherapy, 33(50)		Mean (22.4)	21(63.63)		1-Palms 12 (36.36) 2-Soles 14 (42.42) 3-Multiple sites 7 (21.21)	<6 months, 24 (72.72%)
6	**Elghareeb et.al 2019(6)**	**Implantation,** 40 (50)	Egypt	NR	NR	NR	NR	NR
		MMR, 40 (50)						

Number of sessions, (mean ± SD)	Adverse events, n (%)	Recurrence rate, n (%)	Inclusion criteria	Primary endpoints	Conclusion
1-One, 1 (5%) 2-Two, 2 (10%) 3-Three, 5 (25%) 4- Four, 8(40%)	NR	0 (0)	Patients with single or multiple plantar warts ranged in age from 10 to 60 years old.	1-Over response 2-Compelet response 3-Partial response 4-No response	"Intralesional Vit. D3 and Zinc sulfate are effective treatment modalities for plantar warts."
1-One, 3 (15%) 2-Two, 3 (15%) 3-Three, 1 (5%) 4- Four, 7(35%)		2 (14.28)			
Three sessions, 23 (100%)	NR	0 (0)	Patients with multiple common and/or plantar warts	1-Over response 2-Compelet response 3-Partial response 4-No response	"Both IL Vit D3 and PPD showed positive results in treating multiple warts. However, PPD showed higher clinical efficacy and increased both IL-12 and IFN-γ levels."
1- Two sessions, 3 (13.63%) 2-Three sessions, 19 (86.36%)		0 (0)			
Three sessions, 30 (100%)	NR	3 (16.6)	Patients had either single or multiple extragenital cutaneous warts of more than 1-year duration	1-Over response 2-Compelet response 3-Partial response 4-No response	"Intralesional MMR vaccine is an effective treatment option in patients with multiple extragenital warts. It is suggested that it should be used as first-line therapy for multiple warts and a second-line therapy for warts recalcitrant to standard therapies."
Three sessions, 30 (100%)		4 (57.1)			
3.7± 1.0	NR	2 (2.7)	Patients who presented to the outpatient department of dermatology with cutaneous warts anywhere on the body other than the anogenital area for a duration of at least one A month without using anti-wart treatments for the last month.	Evaluate the efficacy and safety of intralesional MMR antigen in treating cutaneous warts.	"MMR injection has shown significant results with almost negligible adverse effects. The MMR antigen vaccine has therapeutic potential as a treatment for warts with its demonstrated efficacy, safety profile, and cost-effectiveness."
4.4± 0.7		3 (6)			
Up to 12 sessions	NR	0 (0)	Patients over 12 years presenting with single or multiple refractory extragenital warts that were 1 cm in size or larger were recruited.	Response to treatment (Response, Complete response, Partial response, No response), adverse effects, and any recurrence	"Mw vaccine and cryotherapy are equally efficacious in treating refractory extragenital warts. Mw vaccine has an added advantage of clearance of distant warts."
Up to 12 sessions		1 (3.03)			
UP to 4 sessions	0	NR	Wart patients with no concurrent systemic or topical wart treatment and patients with no concomitant intake of immunosuppressives	1-Over response 2-Compelet response 3-Partial response 4-No response	"Autoimplantation is a suitable approach for patients with multiple warts associated with distant lesions, while MMR injection is ideal for a single or fewer warts."
UP to 4 sessions	5(12.5)				

Table S1. Summary and baseline characteristics of the included studies. *(continued)*

N	Study ID	Study arms, n (%)	Site	Age, (mean ± SD) y	Male, n (%)	Follow-up duration (months)	Type of Warts, n (%)	Warts Duration (months), (mean ± SD)
7	**Hodeib et.al 2019(7)**	**C.albicans Ag,** 20 (33.33)	Egypt	18.9±7.7	7(35)	Mean (Two)	plane warts, 20 (100))	NR
		Bleomycin, 20 (33.33)		25.1±9.4	8(40)		plane warts, 20 (100))	
		5-FU, 20 (33.33)		22.95±10.7	6(30)		plane warts, 20 (100))	
8	**Horn et.al 2005(8)**	**MCT,** 54 (26.87)	United states	Mean (37)	23(42.59)	0	NR	NR
		MCT Ag and IFN alpha-2b, 41 (20.40)		Mean (38)	12(29.27)			
		IFN alpha-2b, 46 (22.89)		Mean (40)	21(45.65)			
		Placebo, 60(29.85)		Mean (34)	28(46.67)			
9	**Khozeimeh et.al 2017(9)**	**C.Albicans Ag,** 30 (50)	Iran	23.43±6.69	19(63.33)	More than six months	1-Verruca vulgaris 16 (53.33) 2-Plantar warts 14 (46.67) 3-Both 0 (0)	NR
		Cryotherapy, 30 (50)		28.73±13.86	17(56.67)		1-Verruca vulgaris 19 (63.33) 2-Plantar warts 3 (10) 3-Both 8 (26.67)	NR
10	**Milante et.al 2019(10)**	**PPD,** 29(50)	Philippines	30.66±10.49	16(55.2)	Mean (Six)	Multiple verruca vulgaris, 29(100)	<6 months, 6 (20.7)
		Multiple PPD, 29(50)		30.76±10.05	14(48.3)		Multiple verruca vulgaris, 29(100)	<6 months, 6 (20.7)

Number of sessions, (mean ± SD)	Adverse events, n (%)	Recurrence rate, n (%)	Inclusion criteria	Primary endpoints	Conclusion
2 ± 0.6	NR	0 (0)	Patients of different age s with clinically and dermoscopically diagnosed plane warts were recruited from the outpatient clinics of the Dermatology and Venereology Department.	1-Over response 2-Compelet response 3-Partial response 4-No response	"C. albicans antigen, bleomycin and 5-FU are helpful modalities for treating VP. Bleomycin was the most effective, followed by the C. albicans antigen, and then 5-FU (least effective). The single injection site, clearance of distant warts and decreased incidence of new lesion development - in situ or elsewhere - are additional merits of C. albicans immunotherapy. These modalities are cheap with only transient adverse effects."
1.8 ± 0.5		0 (0)			
2.8 ± 1.09		0 (0)			
NR	NR	NR	Patients (or their guardians) clinically diagnosed as having 1 or multiple warts provided informed consent and were randomized after obtaining a positive intradermal pretest result	1-Over response 2-Compelet response 3-Partial response 4-No response	"Intralesional immunotherapy using injection of Candida, mumps, or Trichophyton skin test antigens is an effective treatment for warts, as indicated by significantly higher response rates and distant response rates in subjects receiving antigen. Viral type and major histocompatibility complex antigens did not influence treatment response. The response is accompanied by a proliferation of peripheral blood mononuclear cells to human papillomavirus antigens, suggesting that human papillomavirus–directed cell-mediated immune response plays a role in wart resolution."
3 sessions	NR	NR	Patients older than 15 years of age with one or more verruca vulgaris or plantar warts, without any concurrent systemic or topical treatments	1-Over response 2-Compelet response 3-Partial response 4-No response 5-Adverse reaction	"Intralesional immunotherapy is an effective treatment of warts. This method has a better therapeutic response, needs fewer sessions, and can treat distant warts."
Up to 10 sessions		NR			
Up to 12 sessions	6(20.69)	0 (0)	Men and women aged 18–65 with multiple common warts (3–20 lesions) located in at least two different anatomic sites, without treatment for warts for at least 1 month.	1-Over response 2-Compelet response 3-Partial response 4-No response	"Multiple injections of warts with PPD cleared more patients with multiple common warts than the use of single injections at the end of 12 weeks and were faster in Clearing patients at every time point. A single injection was better tolerated than multiple injections. Both treatments exhibited similar safety profiles and recurrence rates."
Up to 12 sessions	8(27.59)	0(0)			

Table S1. Summary and baseline characteristics of the included studies. *(continued)*

N	Study ID	Study arms, n (%)	Site	Age, (mean ± SD) y	Male, n (%)	Follow-up duration (months)	Type of Warts, n (%)	Warts Duration (months), (mean ± SD)
11	**Munnangi et.al 2018(11)**	**MMR,** 15(50)	India	21.96±6.79	17(56.6%)	Mean (Three)	Multiple verruca vulgaris, 15(100)	NR
		BCG, 15(50)					Multiple verruca vulgaris, 15(100)	
12	**Nasser et.al 2012(12)**	**PBP imm stimulant,** 10 (50)	Brazil	NR	NR	NR	Common wart 10 (100)	NR
		Placebo, 10 (50)					Common wart 10 (100)	
13	**Nofal et.al 2010(13)**	**MMR ,**70 (63.63)	Egypt	32.4±9.3	31(44.28)	Mean (Six)	Common wart 70 (100)	8.3 ± 5.1
		Placebo,40 (36.36)		30.2±7.8	17(41.5)		Common wart 40 (100)	9.4 ± 6.3
14	**Nofal et.al 2020(14)**	**HPV,** 22(50)	Egypt	29.27±8.7	12(54.5)	Mean (Six)	Recalcitrant multiple common warts	28.8 ± 5.76
		IM HPV, 22(50)		30.27±12.2	12(54.5)		Recalcitrant multiple common warts	54 ± 34.2
15	**Park et.al 2001(15)**	**IFN alpha-2b and PDL,** 13 (39.39)	Korea	27.29±16.4	8(61.54)	Mean (Six)	Single periungual warts	Mean (25.32)
		IFN alpha-2b, 10 (30.30)		19.8±9.26	6(60)		single periungual warts	Mean (18)
		PDL, 10 (30.30)		27±13.17	6(60)		single periungual warts	Mean (18.6)

Number of sessions, (mean ± SD)	Adverse events, n (%)	Recurrence rate, n (%)	Inclusion criteria	Primary endpoints	Conclusion
NR	0	NR	1. Patients with multiple verruca vulgaris (more than one) 2. Age more than 12 years 3. No concurrent treatment for verruca	1-Over response 2-Compelet response 3-Partial response 4-No response 5-Adverse reaction	"The treatment of common warts by intralesional MMR vaccine is effective, with good cure rates, and excellent safety profile compared to intralesional BCG."
	5(33.33)				
NR	NR	NR	Individuals with a clinical diagnosis of common wart, from both sexes, regardless of age or race, previously informed about the nature of the procedures and with formal approval (through the informed consent form)	1-Over response 2-Compelet response 3-Partial response 4-No response	"The immune modulator and immune stimulant Propionium bacterium parvum produced antibodies in the skin which destroyed warts without scars, with statistically significant results (P<0,001), and cured 90 % of the patients. We suggest the use of the immune stimulant in the treatment of warts."
Up to 5 sessions	NR	0(0)	Patients presenting with single or multiple, recalcitrant or non-recalcitrant common warts of different sizes and durations and with or without distant warts	1-Over response 2-Compelet response 3-Partial response 4-No response	"Intralesional immunotherapy by MMR vaccine is a promising effective and safe treatment modality for common warts, particularly the multiple ones."
Up to 5 sessions		3 (7.5)			
Up to 4 sessions	NR	0(0)	1-Patients with recalcitrant multiple common warts (warts of more than 2 years duration that showed no response to at least 2 treatment modalities) 2- approval by the institutional review board (IRB). 3-Signed written consent	1-Compelet response 2-Partial response 3-No response	"Bivalent HPV vaccine, particularly by intralesional injection, seems to be a potential therapeutic option for the treatment of multiple recalcitrant common warts."
Up to 6 sessions		0(0)			
DL laser therapy was performed first, and the intralesional Interferon α-2b was injected.	NR	1/12 (8.3)	1- Patients with single periungual warts were restricted to the finger, not the toe, affecting nail folds and surrounding tissues. 2- patients had recalcitrant warts (had a failure of at least one type of conventional treatment modality). 3- Patients filled out an informed consent. 4- Patient with good general health.	1-Compelet response 2-Partial response 3-No response	"The combination therapy with intralesional interferon α-2b treatment and pulsed dye laser therapy was highly effective for the treatment of recalcitrant periungual warts"
9 sessions		1/5 (20)			
3 sessions		0(0)			

Table S1. Summary and baseline characteristics of the included studies. *(continued)*

N	Study ID	Study arms, n (%)	Site	Age, (mean ± SD) y	Male, n (%)	Follow-up duration (months)	Type of Warts, n (%)	Warts Duration (months), (mean ± SD)
16	**Rezai et.al 2019(16)**	**MMR,** 30 (50)	Iran	27.2±8.73	12(40)	Mean (Six)	1-Palmar, 14 (46.7) 2-Planta, r 14 (46.7) 3-Both, 2 (6.7)	Mean (27.12)
		Placebo, 30 (50)		25.37±9.23	11(36.7)		1-Palmar, 20 (66.7%) 2-Plantar, 10 (33.3%) 3-Both, 0 (0.0%)	Mean (27.6)
17	**Zamanian et.al 2014(17)**	**MMR,** 24 (52.17)	Iran	18.9±12	13(54.2)	Mean (Six)	cutaneous warts, 24 (100)	NR
		Placebo, 22(47.83)		20.1±10	12(54.5)		cutaneous warts, 22 (100)	NR
18	**Abd ElMagiud et.al 2020(18)**	**MMR,** 20 (50)	Egypt	25.20±6.03	14(70.0)	Mean (One)	Common, 10 (50.0) Plantar, 10 (50.0)	15.35 ± 15.03
		Cryotherapy, 20 (50)		28.00±8.81	12(60.0)		Common, 10 (50.0) Plantar, 10 (50.0)	9.60 ± 7.00
19	**AbdelAal et.al 2020(19)**	**Vit D3,** 20 (50)	Egypt	30.4±8.6	10(50)	Mean (Six)	Planter, 20 (100)	4.4±1.6
		C.Albicans Ag, 20 (50)		31.9±9.7	10(50)		Planter, 20 (100)	4.3±1.7
20	**Abdel-Azim et.al 2020(20)**	**Vit D3,** 32 (51.61)	Egypt	21.8±9.9	18(56.3)	Mean (Six)	1-Palmar, 16 (22.2) 2-Plantar, 52 (72.2) 3-Periungual, 4 (5.6)	4.88 ± 2.17
		Placebo, 30 (48.39)		23.2±6.3	24(80)		1-Palmar,48 (72.7) 2-Plantar, 18 (27.3) 3-Periungual, 0 (0)	5.6 ± 2.4

Number of sessions, (mean ± SD)	Adverse events, n (%)	Recurrence rate, n (%)	Inclusion criteria	Primary endpoints	Conclusion
up to 5 sessions	NR	0(0)	1-Presence of resistant-to-therapy palmoplantar warts, defined as warts persisting more than two years despite the application of at least two therapeutic methods 2-or warts unresponsive to treatment,3- Warts were diagnosed by the expert dermatologist through history taking and physical examination	1-Compelet response 2-Partial response 3-No response	"Intralesional immunotherapy with the MMR vaccine may result in a desirable therapeutic response and can be used as an effective and safe treatment option for palmoplantar warts, particularly persistent ones."
up to 5 sessions		0(0)			
up to 3 sessions	NR	NR	1-Women who were not pregnant or breast feeding 2-not having received anti-wart treatment within the past 4 weeks 3-lack of viral infections such as herpes and/or bacterial infections such as impetigo in skin 4-lack of any infective febrile disease 5-completing the treatment course in this study	1-Compelet response 2-Partial response 3-No response	MMR vaccine may result in a desirable therapeutic response. The hypothesis that is considered here is that MMR vaccine, via induction of cellular and humoral immune system, accelerates the destruction of virus and infected host cells."
up to 3 sessions		NR			
up to 3 sessions	NR	NR	1-Patients with multiple common and plantar warts, with no concurrent treatment of warts, either topical or systemic. 2-patients with positive reaction to the injection of 0.1 ml of MMR vaccine intradermally (presence of at least 5 mm erythema and induration by 48–72 hr)	1-Compelet response 2-Partial response 3-No response	"Intralesional MMR injection was a safe and effective treatment for multiple common and plantar warts as compared to cryotherapy."
up to 3 sessions					
2.5±0.7	NR	1/8 (12.5%)	1-Patients with three or more recurrent or recalcitrant warts 2-Tested positive for C. Albicans Ag 3-Aged 20–40	1-Compelet response 2-Partial response 3-No response 4-adverse effect	"Treatment of multiple warts by intralesional injection of C. Albicans Ag or Vit D3 is safe and effective, with good cure rates, has an excellent safety profile, with minimal recurrences and statistically equivalent."
2.6±0.6		1/9 (11.1%)			
3.56±0.76	NR	0 (0)	1-Patients with recalcitrant single or multiple palmoplantar and/or periungual warts	1-Compelet response 2-Partial response 3-No response	"Vit D3 is an effective and safe treatment option for cutaneous warts. The use of dermoscopy adds a great value in evaluating treatment response and decreasing the incidence of recurrence."
4		0 (0)			

Table S1. Summary and baseline characteristics of the included studies. *(continued)*

N	Study ID	Study arms, n (%)	Site	Age, (mean ± SD) y	Male, n (%)	Follow-up duration (months)	Type of Warts, n (%)	Warts Duration (months), (mean ± SD)
21	**Abdelrazik et.al 2021(21)**	**C.Albicans Ag,** 30 (37.5)	Egypt	26.67±12.45	15(50.0)	Mean (Six)	Multiple recalcitrant common warts, 30 (100)	17.64 ± 3.04
		Vit D3, 30 (37.5)		24.83±7.78	9(30.0)		Multiple recalcitrant common warts, 30 (100)	17.38 ± 3.29
		Placebo, 20 (25)		26.33±6.38	9(45.0)		Multiple recalcitrant common warts, 20 (100)	16.82 ± 2.74
22	**Alajlan et.al 2020(22)**	**PPD,** 62 (75.61)	Saudi Arabia	27.33±17.46	23	Mean (Three)	NR	More than 12 weeks
		Placebo, 20 (24.39)		23.33±10.37	6		NR	More than 12 weeks
23	**Almabrouk et.al 2022(23)**	**Vit D3,** 15(33.33)	Libya	23.2±7.8	7(46.67)	Mean (Six)	1-Common Warts, 2 (13.2) 2-Palmer Warts, 4 (26) 3-Planter Warts, 5 (33.4) 4-Periungular, 4 (26.7)	7.9 ± 5.6
		5% KOH cream, 15(33.33)		30.3±14.6	4(26.67)		1-Common Warts, 0 (0) 2-Palmer Warts, 3 (20.1) 3-Planter Warts, 8 (53.2) 4-Periungular, 4 (26.7)	4.4 ± 3.8
		Combination, 15(33.33)		27.7±11.3	8(53.33)		1-Common Warts, 6 (40) 2-Palmer Warts, 3 (20.1) 3-Planter Warts, 2 (13.2) 4-Periungular, 4 (26.7)	4.8 ± 3.8
24	**Attwa et.al 2020(24)**	**C.Albicans Ag monotherapy,** 20 (33.33)	Egypt	35.35±13.89	6(30)	Mean (Three)	Multiple common warts, 20(100)	17.35 ± 14.39
		Cryotherapy, 20(33.33)		28.05±7.45	10(50)		Multiple common warts, 20(100)	12.10 ± 8.53
		C.Albicans Ag and Cryotherapy, 20(33.33)		32.85±10.79	9(45)		Multiple common warts, 20(100)	15.35 ± 8.76
25	**Awad et.al 2023(25)**	**PPD,** 25(50)	Egypt	29.76±13.18	21(84)	Mean (Two)	Multiple common warts, 25 (100)	113.76 ± 90.72
		Cryotherapy and PPD, 25 (50)		33.24±11.05	15(60)		Multiple common warts, 25 (100)	162.24 ± 112.8

Number of sessions, (mean ± SD)	Adverse events, n (%)	Recurrence rate, n (%)	Inclusion criteria	Primary endpoints	Conclusion
Up to 4 sessions	NR	0 (0)	1-Patients with multiple, recalcitrant common warts of different sites, sizes, and numbers, with or without distant lesions. 2-Recalcitrant warts were defined as "warts that persisted for more than 1 year and were resistant to at least two therapeutic modalities".	1-Compelet response 2-Partial response 3-No response	"Intralesional injection of C. Albicans Ag is a safe, simple, cost-effective treatment modality for multiple recalcitrant common warts, and it outperforms intralesional Vit D3."
Up to 4 sessions		0 (0)			
Up to 4 sessions		0 (0)			
UP to 3 sessions	NR	0(0)	1- Patient 18 years and older 2-Immunocompetent and 3-Not receiving any wart therapies (including herbal remedies) for the last 12 weeks 4 In the PPD, a positive skin test with tuberculin antigen was required	1-Compelet response 2-Partial response 3-No response	"Immunotherapy with intradermal injection of PPD of tuberculin skin antigen is an effective and safe treatment modality for multiple and resistant warts. Multiple PPD injections in one session are more effective than a single injection. Positive PPD skin test is not mandatory for efficacy in our study population."
UP to 3 sessions		0 (0)			
UP to 8 sessions	NR	0 (0)	1-Patients diagnosed with warts of variable size and duration 2-Aged 10 - 60 years.	1-Compelet response 2-Partial response 3-No response	"It could be concluded that intralesional vitamin D with 5% KOH cream is safe, effective, and inexpensive treatment option for recalcitrant palmoplantar and periungual warts."
NR		0 (0)			
		0 (0)			
UP to 5 sessions	NR	2 (10)	1-Adults older than 18 years 2-With multiple (>3 warts) common warts 3-Not currently using other treatments for a wart or had relapsed at least once after treatment with any of the tissue-destructive modalities	1-Compelet response 2-Partial response 3-No response 4- adverse effect	"Cryo-immuno-therapy' is a new combination therapy for multiple common warts. This combination is easy to apply, safe, of low cost, and higher efficacy in contrast to the traditional intralesional C. Albicans Ag monotherapy."
Up to 5 sessions		4 (20)			
Up to 5 sessions		2 (10)			
Up to 4 sessions	NR	5 (25)	1-A adults older than 18 years 2-multiple (>3 warts) common warts. 3-not currently using other treatments for a wart. 4-not had relapsed at least once after treatment with any of the tissue-destructive modalities. 5-Positive tuberculin skin test.	1-Compelet response 2-Partial response 3-No response	"Both intralesional PPD alone and combined cryotherapy with PPD are safe and effective in clearing common warts. Cryotherapy may be a successful adjunct to intralesional PPD immunotherapy that helps reduce the number of treatment sessions."
Up to 4 sessions		0(0)			

Table S1. Summary and baseline characteristics of the included studies. *(continued)*

N	Study ID	Study arms, n (%)	Site	Age, (mean ± SD) y	Male, n (%)	Follow-up duration (months)	Type of Warts, n (%)	Warts Duration (months), (mean ± SD)
26	**Chandra et.al 2019(26)**	**PPD,** 32(50)	India	NR	NR	Mean (Three)	1-Verruca vulgaris, 15 (46.9) 2-Verruca plana, 12 (37.5) 3-Periungual, 5 (15.6) 4-Palmoplantar, 7 (21.9)	33.36 ± 41.76
		Mw, 32(50)		NR	NR		1-Verruca vulgaris, 15 (46.9) 2-Verruca plana, 6 (18.8) 3-Periungual, 7 (21.9) 4-Palmoplantar, 7 (21.9)	35.64 ± 39.96
27	**Chaudhary et.al 2023(27)**	**MMR,** 25 (25)	India	Range (18-75)	58(58)	Mean (Three)	Multiple cutaneous warts, 25 (25)	NR
		PPD, 25 (25)					Multiple cutaneous warts, 25 (25)	NR
		C.Albicans Ag, 25 (25)					Multiple cutaneous warts, 25 (25)	NR
		Vit D3, 25 (25)					Multiple cutaneous warts, 25 (25)	NR
28	**D'Souza et.al 2023(28)**	**MMR,** 24 (52.17)	India	Mean (29.77)	11(45.8)	Mean (Three)	common wart, 24(100)	NR
		Formic Acid 85%, 22 (47.83)		Mean (29.8)	12(54.5)		Common wart, 22(100)	NR
29	**Diab et.al 2022(29)**	**PPD,** 20(50)	Egypt	31.10±11.73	5(25)	Mean (Three)	1-Common, 20 (100) 2-Common & planter, 0 (0)	17.42 ± 11.41
		PPD and Isotretinoin, 20(50)		32.05±8.80	5(25)		1-Common, 19 (95) 2-Common & planter,) 1 (5)	13.75 ± 7.20
30	**El Sayed et.al 2020(30)**	**Zinc Sulfate,** 35 (33.33)	Egypt	33.03±8.84	18(51.4)	Mean (Three)	plantar warts, 35(100)	6.43 ± 4.40
		Vit D3, 35 (33.33)		32.03±13.37	25(71.4)		plantar warts, 35(100)	7.46 ± 4.51
		Placebo, 35 (33.33)		4.63±12.91	23(65.7)		plantar warts, 35(100)	6.6 ± 3.46
31	**El-Dahshan et.al 2021(31)**	**MMR,** 30(33.33)	Egypt	34.6±9.7	14(46.67)	Mean (Six)	Multiple recalcitrant extragenital warts, 30 (100)	31.2± 10.68
		BCG, 30 (33.33)		35.7±11.05	17(56.67)		Multiple recalcitrant extragenital warts, 30 (100)	33.24±12.84
		C.Albicans Ag, 30(33.33)		35.2±9.07	16(35.3)		Multiple recalcitrant extragenital warts, 30 (100)	34.5±12.72

Number of sessions, (mean ± SD)	Adverse events, n (%)	Recurrence rate, n (%)	Inclusion criteria	Primary endpoints	Conclusion
Up to 6 sessions	NR	0(0)	1-Adult consenting patients 2- Age 18–65 years of either sex 3-suffering from multiple viral warts (≥5 in number)	1-Compelet response 2-Partial response 3-No response	"Immunotherapeutic antigens PPD and Mw vaccine are effective and safe in the treatment of multiple warts in the Indian setting."
Up to 6 sessions		0(0)			
Up to 3 sessions	NR	NR	1-Patients with multiple (>5) cutaneous warts 2-Aged between 18 and 75 years 3-Had not been previously treated with any other modality 4-Gave consent	1-Compelet response 2-Partial response 3-No response 4-adverse effect	"Intralesional immunotherapy is a safe, affordable, and efficacious treatment for warts."
Up to 3 sessions		NR			
Up to 3 sessions	NR	NR			
Up to 3 sessions		NR			
Up to 5 sessions	NR	0(0)	1-Signed informed consent 2-Patients having single or multiple common warts or palmoplantar warts up to a maximum of 10 lesions 3-above 18 years of age and 4-No concurrent systemic or prior topical treatment of warts	1-Compelet response 2-Partial response 3-No response	"Immunotherapy by intralesional MMR vaccine is a simple, welltolerated, effective and cost–benefit modality for the treatment of warts and showed a statistically significant cure rate than formic acid therapy."
Up to 5 sessions		0(0)			
5.65 ± 0.74	NR	1 (5)	1. Patients with multiple common warts (>3 lesions). 2. Age range (18–65 years old). 3. Good general health condition.	1-Compelet response 2-Partial response 3-No response	"In common warts, the low dose of isotretinoin did not add a true therapeutic value in the studied s. Perhaps higher doses of isotretinoin could provide a better response, which warrants further investigation."
5.80 ± 0.52		0(0)			
Up to 4 sessions	NR	NR	1- Patients recently diagnosed with plantar warts 2-age more than 18 years old 3-Not pregnant or lactating females 4-Not received vaccination, immunomodulation, or any other treatment of warts in the past 3 months.	1-Compelet response 2-Partial response 3-No response	"Both intralesional 2% zinc sulfate and Vit D3 are effective in the treatment of plantar warts, with zinc sulfate being more effective."
Up to 4 sessions		NR			
Up to 4 sessions		NR			
3.46 ± 0.86	NR	0(0)	1-Adult patients under no concurrent systemic or topical treatment of warts within the past 4 weeks 2- Not pregnant or lactating females 3- Not taking immunosuppressive medication	1-Compelet response 2-Partial response 3-No response	"All three modalities used demonstrated a simple, safe modality with low adverse events and no recurrence. To achieve an optimal response with an ideal immunotherapeutic agent and ideal dose, further comparative studies are warranted on different populations and larger sample sizes."
3.40 ± 0.75		0(0)			
3.85 ± 0.89		0(0)			

Table S1. Summary and baseline characteristics of the included studies. *(continued)*

N	Study ID	Study arms, n (%)	Site	Age, (mean ± SD) y	Male, n (%)	Follow-up duration (months)	Type of Warts, n (%)	Warts Duration (months), (mean ± SD)
32	**ELKomy et.al 2023(32)**	**C.Albicans Ag,** 20(50)	Egypt	30.00±7.167	14(70.0)	Mean (One)	1-Common, 9 (45) 2-Filiform, 0 (0) 3-Flat, 0 (0) 4-Periungual, 2 (10) 5-Plantar, 9 (45)	2.28±2.25
		DPCP, 20(50)		30.10±6.480	9(45.0)		1-Common, 8 (40) 2-Filiform, 2 (10) 3-Flat, 1 (5) 4-Periungual, 0 (0) 5-Plantar, 9 (45)	2.61±2.26
33	**Ghaly et.al 2020(33)**	**PPD,** 20 (33.33)	Egypt	23.20±6.98	14(70)	Mean (Six)	Planter, 20 (100)	6.52 ± 4.14
		Vit D3, 20 (33.33)		25.90±5.40	12(60)		Planter, 20 (100)	8.72 ± 6.78
		Placebo, 20(33.33)		26.10±7.21	8(40)		Planter, 20 (100)	7.34 ± 4.95
34	**Gupta et.al 2020(34)**	**MMR,** 33(50)	India	24.6±6.74	17(51.5)	Mean (Three)	Verruca vulgaris, 33(100)	28.22 ± 28.28
		MMR ID, 33(50)		26.3±9.04	20(60.6)		Verruca vulgaris, 33(100)	44.71 ± 51.19
35	**Ibrahim et.al 2020(35)**	**Vit D3,** 18(32.14)	Egypt	29±8.45	11(61.11) 9(40.91) 8(50)	Mean (Six)	1-Palmar, 7 (38.89) 2-Planter, 11 (61.11) 3-Sunungual, 0 (0)	8.92 ±4.22
		PDT, 22(3.29)		29.08±12.09	9(40.91)		1-Palmar, 11 (50) 2-Planter, 5 (22.73) 3-Sunungual, 6 (27.27)	8.17 ±3.57
		Placebo, 16(28.57)		34.5±4.06	8(50)		1-Palmar, 6 (37.5) 2-Planter, 10 (62.5) 3-Sunungual, 0 (0)	7.92 ± 3.05
36	**Ibrahim et.al 2021(36)**	**Cryotherapy,** 25(33.33)	Egypt	24.00±12.5	13(52)	NR	Common wart, 25 (100)	7.80 ± 4.0
		PPD, 25(33.33)		23.36±9.9	13(52)		Common wart, 25 (100)	8.28 ± 3.1
		PPD and Cryotherapy, 25(33.33)		23.68±11.1	11(44)		Common wart, 25 (100)	8.64 ± 4.1

Number of sessions, (mean ± SD)	Adverse events, n (%)	Recurrence rate, n (%)	Inclusion criteria	Primary endpoints	Conclusion
2.55±0.759	8(40)	NR	1-Patients with either recalcitrant or non-recalcitrant warts. 2-Warts were considered recalcitrant when they failed to clear following treatment with two or more different modalities 3-patients not receiving any immune-altering drugs 4- No history of any disorder affecting their immune system.	1-Compelet response 2-Partial response 3-No response	"Intralesional C. Albicans Ag injection and DPCP treatments for warts yielded improvement with superiority of Candida injection in eradicating distant lesions and fewer side effects. A shorter wart duration may result in a better therapeutic response with C. Albicans Ag."
3.85± 1.040	20(100)	NR			
Up to 3 sessions	NR	0(0)	1-Patients representing single or multiple plantar warts of different sizes and durations with or without distant warts 2-Agreed to join the study and signed written informed consent 3-continued till the end of the 6-month follow-up period 4-Sign consent to taking photographs	1-Compelet response 2-Partial response 3-No response	"Both IL PPD and Vit.D 3 injection are safe and effective for treating plantar warts, even recalcitrant or multiple, with no postprocedural downtime, better results, and patient satisfaction. IL Vit.D3 injection has a superior advantage than PPD."
Up to 3 sessions		0(0)			
Up to 3 sessions		0(0)			
Up to 4 sessions	NR	NR	1-Patients willing to consent 2-having multiple common warts (verruca vulgaris) (>5) at various sites of the body 3-Of the age 12–40 years.	1-Complete response 2-Marked response 3-Moderate response 4-Mild response 5-No response	"MMR vaccine is an effective and safe modality of treatment for verruca vulgaris without any serious adverse effects. Also, the intralesional route showed better results in comparison to the intradermal route when we consider the treatment of a representative wart."
Up to 4 sessions		NR			
3 ±0	NR	0(0)	1-Patients with recalcitrant palmoplantar warts 2- Ages were not less than 18 years 3- non-pregnant or lactating females. 4- Not taking any topical treatment modality for warts in the previous month or any systemic treatment modality in the previous 2 months	1-Complete response 2-Marked response 3-Moderate response 4-Mild response 5-No response	"Both Vit D3 and PDT using Eosin are safe, highly effective and well-tolerated modalities in the treatment of viral warts."
6±3.17		1 (4.55)			
NR		0(0)			
3.68 ± 0.1	NR	NR	1-Patients with more than two common warts 2-age more than 5 years old 3-no concurrent systemic or topical treatment 4-With history of BCG vaccination	1-Excellent 2-Very good 3-Poor 4-No response	"Cryotherapy combined with intralesional injection of PPD and intralesional injection of PPD alone are better than cryotherapy alone in the treatment of multiple common warts. However, the better response could be reached in a combination of both cryotherapy and intralesional PPD with a smaller number of sessions."
3.68 ± 0.1					
2.56 ± 0.2					

Table S1. Summary and baseline characteristics of the included studies. *(continued)*

N	Study ID	Study arms, n (%)	Site	Age, (mean ± SD) y	Male, n (%)	Follow-up duration (months)	Type of Warts, n (%)	Warts Duration (months), (mean ± SD)
37	**Ibrahim et.al 2020(2)(37)**	**Ozone gas,** 44(59.46)	Egypt	34.3±12.8	17(38.6)	Mean (Six)	1-Common warts, 50 (65) 2-Periungual warts, 7 (10) 3-Plantar warts. 14 (19) 4-Plane warts, 3 (4)	7.6 ± 5.4
		Placebo, 30 (40.54)		32.6±11.8	13(43.3)			8.1 ± 4.6
38	**Jartarkar et.al 2021 (2)(38)**	**Vit D3,** 30(50)	India	32.07±7.48	16(53.3)	Mean (12)	Planter,30 (100)	NR
		Placebo, 30 (50)		29.63±7.55	18(60)		Planter,30 (100)	NR
39	**Jartarkar et.al 2021(39)**	**Vit D3,** 33(50)	India	31±9.2	NR	Mean (Three)	1-verruca vulgaris 2-filiform warts 3- verruca plana	2 months to 4 years
		MMR, 33(50)		27±5.8				2 months to 6.5 years
40	**Kammal et.al 2021(40)**	**PPD,** 30 (50)	Malaysia	28.9±7.14	4(26.7)	Mean (Four)	NR	NR
		Cryotherapy, 30(50)		25.07±4.71	6(40)			
41	**Lotfy et.al 2022(41)**	**Furosemide and Digoxin,** 40(50)	Egypt	27.15±8.122	17(42.5)	Mean (Six)	1-Dorsal, 17 (42.5) 2-Planter, 10 (25.0) 3-Palmer, 13 (32.5)	22.60 ± 9.98
		Placebo, 40 (50)		7.18±8.28	21(52.5)		1-Dorsal, 19 (47.5) 2-Planter, 11 (27.5) 3-Palmer, 10 (25.0)	21.30 ± 7.58

Number of sessions, (mean ± SD)	Adverse events, n (%)	Recurrence rate, n (%)	Inclusion criteria	Primary endpoints	Conclusion
Up to 10 sessions	NR	2 (5)	1-Adult patients (age criteria not explicitly mentioned). 2-Patients diagnosed with multiple common warts of varying durations. 3-Patients recruited consecutively from the dermatology outpatient clinic at Zagazig University (ZU) Hospital between October 2015 and September 2016. 4-Patients randomly assigned to one of the two s based on the day of attendance at the clinic (Saturday, Monday, or Wednesday for treatment; other days for control). 5-Patients who provided informed written consent to participate in the study.	1-Compelet response 2-Partial response 3-No response	"Intralesional ozone is effective and safe for treating multiple warts."
Up to 10 sessions		3 (15)			
Up to 4 sessions	NR	2 (6.7)	1-Patients with multiple recurrent plantar warts of different sizes and duration 2-With/out distant warts 3-Willing to provide informed written consent	1-Compelet response 2-Partial response 3-No response	"Intralesional Vit D3 is a safe and effective treatment option for multiple recurrent plantar warts."
Up to 4 sessions		NR			
Mean (3.8)	NR	0(0)	1-Patients with single or multiple recurrent viral warts. 2-Patients willing to provide voluntary written consent to participate in the study.	1-Compelet response 2-Partial response 3-No response	"Intralesional MMR and Vit D3 are promising options for recurrent warts."
Mean (3.2)		0(0)			
Mean (Three)	NR	2(6.67)	1-Patients aged between 18 to 40 years. 2-Patients with at least two warts. 3-Warts left untreated for a minimum of 4 weeks. 4-Informed consent was obtained from all participants.	1-Reduction in surface area of the largest wart 2-Reduction in the total number of warts 3-Frequency of adverse effects	"Tuberculin immunotherapy and cryotherapy are equally effective in treating warts. Immunotherapy has added benefit with resolution of distant warts. Safety profiles were similar except for blisters, which were more common with cryotherapy."
Mean (Four)		3(10)			
Up to 5 sessions	38(95)	0(0)	1-Adult healthy patients 2-Of both genders 3-Older than 18 years 4-@ith multiple (≥2 warts) cutaneous warts with different sizes.	1-Compelet response 2-Partial response 3-No response	"Intralesional injection of combined furosemide and digoxin can be a safe and effective treatment option in multiple cutaneous warts with minimal side effects in this study."
Up to 5 sessions	18(45)	5/10 (50.0)			

Table S1. Summary and baseline characteristics of the included studies. *(continued)*

N	Study ID	Study arms, n (%)	Site	Age, (mean ± SD) y	Male, n (%)	Follow-up duration (months)	Type of Warts, n (%)	Warts Duration (months), (mean ± SD)
42	**Mohta et.al 2021(42)**	**MMR,** 33 (37.5)	India	31.60±6.94	19(57.57)	Mean (Six)	1-Verruca vulgaris, 12(36.36) 2- Verruca plana, 7 (21.21) 3-palmoplantar warts, 11 (33.33) 4-periungual warts, 3 (9.09)	9.07±6.03
		Vit D3, 31 (35.23)		33.16±7.81	18(58.06)		1-Verruca vulgaris, 13 (41.94) 2- Verruca plana, 9 (29.03) 3-palmoplantar warts, 8 (25.81) 4-periungual warts, 1(3.23)	8.37±5.87
		Placebo, 24(27.27)		33.02±6.28	15(62.5)		1-Verruca vulgaris, 6 (25) 2- Verruca plana, 8 (33.33) 3-palmoplantar warts, 10(41.67) 4-periungual warts, 0(0)	9.13±5.91
43	**Mohta et.al 2022(43)**	**Mw,** 55 (53.92)	India	23.5±8.4	38(69.09)	Mean (Three)	NR	7.12 ± 4.01
		PPD, 47(46.08)		26.9±11.7	33(7021)			8.71 ± 5.13
44	**Nassar et.al 2020(44)**	**PDT,** 13(33.33)	Egypt	13.8±6.9	6(46.15)	Mean (Three)	1-Plane warts, 11(84.62) 2-other, 2(15.38)	3-60
		C.Albicans Ag, 13 (33.33)		16.5±9.7	5(38.46)		1-Plane warts, 11(84.62) 2-other, 2(15.38)	(3-36)
		Placebo, 13 (33.33)		15.8±11.1			Plane Warts, 13(100)	(3-36)
45	**Nofal et.al 2020 (45)**	**Zinc sulfate,** 38(25)	Egypt	25.21±11.74	24(63.2)	Mean (Six)	plantar warts, 38(100)	43.56 ± 22.23
		Vit D3, 38(25)		27.89±12.66	20(52.6)		plantar warts, 38(100)	41.04±25.44
		C.Albicans Ag, 38(25)		26.32±11.87	20(52.6)		plantar warts, 38(100)	39.96±23.04
		Placebo, 38 (25)		25.64±12.23	24(63.2)		plantar warts, 38(100)	42.24±24.36

Number of sessions, (mean ± SD)	Adverse events, n (%)	Recurrence rate, n (%)	Inclusion criteria	Primary endpoints	Conclusion
Up to 4 sessions	NR	0(0)	1-Immunocompetent adults attending the outpatient department (OPD) of Dermatology, Venereology, and Leprosy. 2-Subjects aged between 18 and 65 years. 3-Clinical diagnosis of two or more recalcitrant extragenital warts at various body sites. 3-Not receiving any concurrent systemic or topical treatment for warts in the past month. 4-Warts not responding to at least two other forms of treatment in the past.	1-Compelet response 2-Partial response 3-No response	"MMR vaccine and Vit D3 are equally effective and safe treatment options for multiple, recalcitrant warts, as well as warts on difficult-to-treat sites with minimal recurrence."
Up to 4 sessions		2 (6.5)			
Up to 4 sessions		2(8.3)			
Up to 4 sessions	NR	0(0)	1- Individuals aged 12 years or above. 2-Participants with two or more warts. 3-Patients with either previously untreated warts or those who had not received treatment in the last month were included.	1-Compelet response 2-Partial response 3-No response 4- adverse effect	"Mw vaccine holds leverage over PPD with a marginally higher rate of clearance and fewer adverse events for managing warts."
Up to 4 sessions		0(0)			
(3-4)	NR	0(0)	1-Patients of both sexes. 2-Patients with multiple plane warts of different sizes and durations. 3-Warts can be either recalcitrant or non-recalcitrant. 4-Presence or absence of distant warts does not exclude participation.	1-Compelet response 2-Partial response 3-No response 4- adverse effect	"C. Albicans Ag immunotherapy is superior to photodynamic therapy in plane warts treatment with the absence of recurrence and comparable side effects in both."
(3-5)		0(0)			
(5-6)		0(0)			
3.1± 0.5	NR	4 (20)	1-Adult patients with recalcitrant plantar warts. 2-Plantar warts of different numbers, sizes, and durations were included. 3-Presence or absence of distant lesions did not exclude participation. 4-Recalcitrant plantar warts were defined as warts lasting more than 2 years that failed to respond to at least 2 different treatment modalities.	1-Compelet response 2-Partial response 3-No response	"Recalcitrant plantar warts were best treated with Vit D3, which also has the advantages of better response on distant warts, minimal side effects, and low rate of wart recurrence."
2.5 ±0.3		2(5.9)			
3.2±0.4		3(12)			
3.8±0.2		3(37.5)			

Table S1. Summary and baseline characteristics of the included studies. *(continued)*

N	Study ID	Study arms, n (%)	Site	Age, (mean ± SD) y	Male, n (%)	Follow-up duration (months)	Type of Warts, n (%)	Warts Duration (months), (mean ± SD)
46	Nofal et.al 2021 (2)(46)	**MMR,** 34(50)	Egypt	30.09±11.09	16(47.1)	Mean (Six)	1-Plantar, 12 (35.3) 2-Common, 22(64.7)	25.56 ± 21.78
		Candida, 34(50)		32.18±9.18	14(41.2)		1-Plantar, 13 (38.2) 2-Common, 21(61.8)	29.12 ± 24.14
47	Nofal et.al 2021(47)	**PPD,** 50 (33.33)	Egypt	11.3±7.64	32(64)	Mean (Six)	Periungual warts, 50 (100)	22.56±25.56
		C.Albicans Ag, 50 (33.33)		14.8±9.2	28(46)		Periungual warts, 50 (100)	13.92±13.56
		MMR, 50(33.33)		16.5±12.7	27(54)		Periungual warts, 50 (100)	12.24±15
48	Nofal et.al 2022 (2)(48)	**C.Albicans Ag,** 50(41.67)	Egypt	Range (18-54)	82(68.33)	Mean (Six)	Plantar wart,50(100)	24 to 96
		PPD, 50(41.67)					Plantar wart,50(100)	
		Placebo, 20(16.67)					Plantar wart,20(100)	
49	Nofal et.al 2022 (3)(49)	**PPD,** 40(25)	Egypt	25.1±11.96	20(50.0)	6	1-Palmar, 10 (25) 2-Plantar, 12 (30) 3-Common 11 (27.5) 4-Subungual, 5 (12.5) 5-Filiform, 1 (2.5) 6-Plane, 1 (2.5)	24.7 ± 15.8
		C.Albicans Ag, 40(25)		26.4±12.3	21(52.5)		1-Palmar, 3 (7.5) 2-Plantar, 19 (47.5) 3-Common, 13 (32.5) 4-Subungual, 4 (10) 5-Filiform, 1 (2.5) 6-Plane, 0 (0.0)	29.6 ± 20.3
		MMR, 40(25)		28.5±13.3	15(37.5)		1-Palmar, 12 (30) 2-Plantar, 3 (7.5) 3-Common, 20 (50) 4-Subungual, 5 (12.5) 5-Filiform, 0 (0.0) 6-Plane, 0 (0.0)	16.2 ± 9.8

Number of sessions, (mean ± SD)	Adverse events, n (%)	Recurrence rate, n (%)	Inclusion criteria	Primary endpoints	Conclusion
up to 5 sessions	NR	0(0)	1-Adult patients diagnosed with multiple common and plantar warts. 2-Written consent was obtained from the participants. 3-Approval from the Institutional Review Board (IRB) of Zagazig University, Egypt.	1-Compelet response 2-Partial response 3-No response	"Intralesional MMR and intralesional C. Albicans Ag showed comparable efficacy and safety in the treatment of common and plantar warts."
up to 5 sessions		0(0)			
3.25 ± 2.45	NR	0(0)	1-Patients presenting with periungual warts of different numbers, sizes, and durations were included. 2-Written informed consent was obtained from each patient before enrollment. 3-The study had been approved by an institutional review board	1-Compelet response 2-Partial response 3-No response	"Intralesional antigen immunotherapy seems to be an effective therapeutic option for the treatment of periungual warts."
1.88 ± 2.13		0(0)			
4.22 ± 1.66		0(0)			
Up to 5 sessions	NR	1(2.3)	1-Adult patients of both sexes were included. 2-Patients presented with multiple (>5) recalcitrant plantar warts of different sizes. 3-Patients could have distant warts or not. 4-Recalcitrance was defined as warts persisting for at least 2 years without responding to at least two different treatment modalities. 5- The patient signed a written consent form before the study.	1-Compelet response 2-Partial response 3-No response	"Intralesional antigen immunotherapy by C. Albicans Ag or PPD is a promising, safe, and cost-effective therapeutic option for multiple recalcitrant plantar warts, with statistically significant superiority of C. Albicans Ag."
Up to 5 sessions		2(7)			
Up to 5 sessions		NR			
Up to 5 sessions	NR	3(8.7)	1-Patients with multiple (three or more warts) recalcitrant extragenital warts. 2-Recalcitrant warts were defined as warts persisting for at least 6 months without responding to at least two different treatment modalities. 3-Warts of different types, sites, sizes, and durations were included. 4-Patients could have distant warts or not.	1-Compelet response 2-Partial response 3-No response	"Triple intralesional antigen immunotherapy is as safe as, and more effective than, monoantigen immunotherapy, and can be added to the armamentarium against recalcitrant human papilloma virus (HPV) infections."
Up to 5 sessions		5(13.8)			
Up to 5 sessions		5(12)			

Table S1. Summary and baseline characteristics of the included studies. *(continued)*

N	Study ID	Study arms, n (%)	Site	Age, (mean ± SD) y	Male, n (%)	Follow-up duration (months)	Type of Warts, n (%)	Warts Duration (months), (mean ± SD)
		PPD and C. Albicans Ag with MMR, 40(25)		28.6±15.2	15(37.5)		1-Palmar, 6 (15) 2-Plantar, 7 (17.5) 3-Common, 24 (60) 4-Subungual, 3 (7.5) 5-Filiform, 0 (0.0) 6-Plane, 0 (0.0)	18.2 ± 7.3
50	**Nofal et.al 2022(50)**	**HBV,** 30 (50)	Egypt	26.68±11.02	20(66.7)	6	Multiple Common Warts, 30(100)	15.54 ± 5.6
		HBV IM, 30(50)		32.41± 13.6110	14(46.7)		Multiple Common Warts, 30(100)	16.9 ± 6.7
51	**Podder et.al 2023(51)**	**BCG,** 33(55)	India	28±10.74	20(60.60)	3	1-Verruca vulgaris, 15 (45.45) 2-Verruca plana, 6(18.18) 3-Palmoplantar wart, 12 (36.36)	11 ± 13.64
		PPD, 27(45)		32.37±12.48	17(62.96)		1-Verruca vulgaris, 19 (70.37) 2-Verruca plana, 4 (14.81) 3-Palmoplantar wart, 4 (14.81)	13.15 ± 8.85
52	**Rafiqu et.al 2023(52)**	**MMR,** 56(50)	Pakistan	30.5±6.0	21(37.5)	3	1-Palms, 23 (41.1) 2-Soles, 20 (35.7) 3-Palms and Soles, 13 (23.2)	NR
		5-FU, 56(50)		28.2±8.7	30(53.6)		1-Palms, 16 (28.6) 2-Soles, 36 (64.3) 3-Palms and Soles, 4 (7.1)	NR

Number of sessions, (mean ± SD)	Adverse events, n (%)	Recurrence rate, n (%)	Inclusion criteria	Primary endpoints	Conclusion
Up to 5 sessions		3(6.45)	5-Approval by the institutional review board (IRB) of the Medical School at Zagazig University, Egypt. 6-Each patient provided informed consent before enrollment.		
Up to 5 sessions	NR	1 (14.3)	1-Patients with multiple (≥3 warts) common warts. 2-Common warts of different numbers, sites, sizes, and durations were included. 3-Patients could have distant warts or not. 4-Approval by the institutional review board (IRB) of the Medical School at Zagazig University, Egypt. 5-Patient provided informed consent before enrollment.	1-Compelet response 2-Partial response 3-No response	"HBV vaccine, particularly the IM form, seems to be a promising, well-tolerated therapeutic option for treating warts."
Up to 5 sessions		1(6.7)			
Up to 4 sessions	NR	0(0)	1-All consecutive patients of either sex were diagnosed with clinically diagnosed cutaneous warts. 2-Patients attending the dermatology outpatient department of Medical College and Hospital, Kolkata. 3-Patients with more than five warts were included in the study.	1-Compelet response 2-Partial response 3-No response	"Both intradermal Bacillus Calmette–Guerin and tuberculin purified protein derivatives hold promise in treating viral warts. Bacillus Calmette–Guerin may be more effective, though it had more adverse events in our study."
Up to 4 sessions		0(0)			
3.38 ± 0.49	NR	23(41.1)	1-Patients between 15 to 65 years old. 2-Patients of any gender having palmoplantar warts. 3-Enrolled patients had palmoplantar warts and were divided into two s (-A and the 5-Fluorouracil). 4-Warts were limited to a maximum of 5 in number regardless of their size.	1-Compelet response 2-Partial response 3-No response	"It was concluded that intra-lesional 5-FU was a more safe and effective treatment compared to injection MMR for palmo-planter warts as it showed a high response rate with low recurrence."
3.27 ± 0.53		16 (28.6)			

Table S1. Summary and baseline characteristics of the included studies. *(continued)*

N	Study ID	Study arms, n (%)	Site	Age, (mean ± SD) y	Male, n (%)	Follow-up duration (months)	Type of Warts, n (%)	Warts Duration (months), (mean ± SD)
53	**Rageh et.al 2022(53)**	**C.Albicans Ag,** 30(50)	Egypt	31.6+11.3	20(66.7)	2	Plantar warts, 30(100)	6.66 ± 3.22
		MMR vaccine, 30(50)		32.2+11.1	24(80.0)		Plantar warts, 30(100)	10.66 ± 8.89
54	**Rajegowda et.al 2020(54)**	**MMR,** 30(50)	Egypt	Mean (27.0327)	17(56.67)	2	Cutaneous warts, 30(100)	NR
		Cryotherapy, 30(50)		Mean (24.732)	18(60)		Cutaneous warts, 30(100)	NR
55	**Rutnin et.al 2022(55)**	**MMR,** 20(50)	Thailand	37.7±13.8	9(45)	6	Palmoplantar/Periungual Warts, 20(100)	51.25 ±44.57
		PPD, 20(50)		42.8±16.6	7(30)		Palmoplantar/Periungual Warts, 20(100)	34±29.5
56	**Shaker et.al 2020(56)**	**MMR vaccine,** 20(33.33)	Egypt	21.7±7.75	10(50)	6	1-Verruca vulgaris in, 8 (4) 2- Plantar warts in, 7 (35) 3-Plane warts in 2 (10) 4-Periungual warts, 2 (10) 5-Genital warts, 1 (5)	18.12 ±10.32
		PPD, 20(33.33)		22.45±9.63	11(55)			19.32 ± 11.04
		BCG, 20 (33.33)		27.85±12.46	9(45)			23.04 ± 7.8

Number of sessions, (mean ± SD)	Adverse events, n (%)	Recurrence rate, n (%)	Inclusion criteria	Primary endpoints	Conclusion
3.98	NR	0(0)	1-Patients over 12 years old. 2-Patients diagnosed with clinically diagnosed plantar warts. 3-Patients with single or multiple plantar warts: 4-Warts that were refractory to treatment (showed no considerable response to at least one destructive therapeutic modality) or 5-Warts that recurred at least once after treatment with a tissue-destructive modality.	1-Compelet response 2-Partial response 3-No response	"Intralesional C. albicans antigen injection is an easy and effective treatment tool for plantar warts, even resistant and recalcitrant ones, with no post-procedural downtime and only transient occasional side effects. MMR vaccine is thought to be less effective."
4.24		0(0)			
Up to 3 sessions	NR	0(0)	1-Clinically diagnosed cases of cutaneous warts based on history and typical clinical features. 1-Patients with multiple cutaneous warts. 3-Patients aged more than 12 years. 4-Patients who had no concurrent systemic or topical treatment for warts within the past 4 weeks. 5-Individuals who provided written informed consent after understanding the nature of the study.	1-Complete clearance 2-Excellent response 3-Good response 4-Poor response 5-Recurrence	"Intralesional MMR vaccine immunotherapy was more effective, with an added advantage of regression of distant warts, fewer sessions, and no serious side effects."
Up to 9 sessions		0(0)			
4.5± 0.8	NR	0(0)	1-Patients aged over 18 years. 2-Patients with single or multiple lesions of clinically diagnosed palmoplantar and/or periungual warts. 3-Patients recruited from the Dermatology Outpatient Clinic.	1-Compelet response 2-Partial response 3-No response	"This study suggests that intralesional immunotherapy with either MMR or PPD is efficacious in palmoplantar/ periungual warts, with MMR showing a trend toward higher clearance and lower adverse events."
4.2 ± 1.1		0(0)			
Up to 3 sessions	NR	0(0)	1-Patients with single or multiple warts. 2-Age greater than 5 years.	1-Compelet response 2-Partial response 3-No response	" Immunotherapy by IL tuberculin and ID BCG vaccination are safe, effective, and inexpensive techniques in treating all types of warts even if recalcitrant or multiple, but immunotherapy by IL MMR vaccine has shown less effectiveness and less safety technique."
Upp to 3 sessions		0(0)			
Upp to 3 sessions		1(5)			

Table S1. Summary and baseline characteristics of the included studies. *(continued)*

N	Study ID	Study arms, n (%)	Site	Age, (mean ± SD) y	Male, n (%)	Follow-up duration (months)	Type of Warts, n (%)	Warts Duration (months), (mean ± SD)
57	**Singh et.al 2022(57)**	**MMR,** 50 (50)	India	25.36±8.85	30(60)	NR	1-Verruca Vulgaris, 12 (24) 2-Verruca Plantaris, 22 (44) 3-Verruca Plana, 8 (16) 4-Genital warts, 2 (4) 5-Filiform warts, 2 (4) 6-Periungual warts, 4 (8)	22.097
		Vit D3, 50(50)		25.88±9.04	36(72)	NR	1-Verruca Vulgaris, 10 (20) 2-Verruca Plantaris, 22 (44) 3-Verruca Plana, 7 (14) 4-Genital warts, 2 (4) 5-Filiform warts, 4 (8) 6-Periungual warts, 5 (10)	11.59
58	**Youssef et.al 2022(58)**	**C.Albicans Ag with 1/100 concentration,** 35(33.33)	Egypt	Range (4-49)	51(48.57)	6	1-Common, 15 (42.9) 2-Plantar, 10 (28.6) 3-Plane, 10 (28.6)	14.49±13.80
		C.Albicans Ag with 1/1000 concentration, 35(33.33)					1-Common, 15 (42.9) 2-Plantar, 10 (28.6) 3-Plane, 10 (28.6)	13.00± 13.10
		Zinc sulfate, 35(33.33)					1-Common, 15 (42.9) 2-Plantar, 10 (28.6) 3-Plane, 10 (28.6)	15.69±13.14
59	**Johnson et.al 2001(59)**	**Cryotherapy,** 26(32.10)	United states	Mean (34.8)	NR	12	1-periungual or palmoplantar warts, 80(98.77) 2-flat warts,1 (1.23)	NR
		Mumps, 45 (55.56)		Mean (31.3)	NR			NR
		C.Albicans Ag, 10(12.34)		Mean (22.1)	NR			NR
60	**Fawzy et.al 2020(60)**	**PPD,** 40(33.33)	Egypt	12.3±8.65	25(62.5)	6	Plane wart, 40(100)	22.56 ± 25.56
		C.Albicans Ag, 40(33.33)		14.8±9.2	18(45)		Plane wart, 40(100)	13.92± 13.56
		MMR, 40(33.33)		19.5±11.6	27(67.5)		Plane wart, 40(100)	23.64 ± 12.24

Number of sessions, (mean ± SD)	Adverse events, n (%)	Recurrence rate, n (%)	Inclusion criteria	Primary endpoints	Conclusion
Up to 3 sessions	NR	NR	1-Clinically diagnosed patients with single or multiple warts. 2-Age between 10 and 50 years. 3-Both genders were included. 4-Patients with no history of anti-wart treatment in the last month.	1-Compelet response 2-Partial response 3-No response	"Both intralesional Vit D3 and MMR are efficacious in treating cutaneous warts, with MMR agents being moderately better compared to Vit D3 in terms of warts clearance and side effects profile."
Up to 3 sessions		NR			
Up to 6 sessions	55(78.57)	1 (2.9)	1-Patients with ages ranging from 10 to 40 years with cutaneous common or planter wart, 2-or were either resistant to treatment 3-or had relapsed at least once after treatment with any of the tissue-destructive modalities	1-Compelet response 2-Partial response 3-No response	"Intralesional immunotherapy with C. Albicans Ag was more effective than Intralesional 2% zinc sulfate in the treatment of cutaneous warts and less painful."
Up to 6 sessions		0(0)			
Upp to 6 sessions	34(97.14)	0(0)			
Up to 3 sessions	NR	2(7.79)	1-Patients with a clinical diagnosis of one or multiple warts 2-Provided informed consent for the study 3-Received an intradermal injection of Mumps test antigen and Candida test antigen	1-Compelet response 2-Partial response 3-No response	"Intralesional injection of mumps or C. Albicans Ags into warts of immune individuals represent effective treatment. Observation of the clearing of anatomically distinct and distant warts suggests the acquisition of human papillomavirus-directed immunity in some patients. We conclude that this novel approach to immunotherapy may serve as first-line treatment in immune individuals with multiple or large warts and as second-line treatment in immune patients for whom cryotherapy fails."
Up to 3 sessions		1(1.82)			
Up to 3 sessions					
Up to 5 sessions	NR	3(7.5)	1-Patients of different age s (children and adults) presenting with multiple plane warts. 2-Written informed consent was obtained from each patient before enrollment into the study.	1-Compelet response 2-Partial response 3-No response	"Intralesional antigen immunotherapy seems to be a promising, well-tolerated and effective therapeutic option for treating multiple plane warts, with relatively higher efficacy of C. Albicans Ag."
Up to 5 sessions		0(0)			
Up to 5 sessions		0(0)			

Table S1. Summary and baseline characteristics of the included studies. *(continued)*

N	Study ID	Study arms, n (%)	Site	Age, (mean ± SD) y	Male, n (%)	Follow-up duration (months)	Type of Warts, n (%)	Warts Duration (months), (mean ± SD)
61	**Lahoria et.al 2022(61)**	**PLACEBO,** 50(25.38)	India	26.4 ± 8.73	44(88)	12.2 (±7.07)	1-Verruca vulgaris, 19 (38 2-Plantar wart, 11 (22) 3-Verruca plana, 11 (22) 4-Filiform wart, 8 (16) 5-Periungual wart, 1 (2)	11.7 ± 16.65
		VIT D3, 50(25.38)		25 ± 8.53	40(80)	12.8 (±5.57)	1-Verruca vulgaris, 20 (40) 2-Plantar wart, 13 (26) 3-Verruca plana, 10 (20) 4-Filiform wart, 7 (14) 5-Periungual wart, 0 (0)	8.6 ± 16.97
		MIP, 4(24.87)		23.8 ± 7.93	36(73.4)	10.5 (±7.4)	1-Verruca vulgaris,17 (35.4) 2-Plantar wart, 14 (29.2) 3-Verruca plana, 10 (20.8) 4-Filiform wart, 6 (12.5) 5-Periungual wart, 1 (2.1)	12.5 ± 11.53
		MMR, 48(24.36)		24.5 ± 7.5	35(72.91)	11.8 (±6.7)	1-Verruca vulgaris, 26 (53.1) 2-Plantar wart, 9 (18.4) 3-Verruca plana, 9 (18.4) 4-Filiform wart, 4 (8.2) 5-Periungual wart,1 (2)	14.8 ± 20.46
62	**Ahmed et.al 2020(62)**	**Vit D3,** 15(34.88)	India	26.± 11.57	17(37.77)	4	1-Verruca vulgaris, 8 (17.8) 2-Filiform wart, 2 (4.4) 3-Palmoplantar wart, 26 (57.8) 4-Plane wart, 9 (20)	12±11.57
		MR, 13(30.23)						
		PPD, 15(34.88)						
63	**Bhalala et.al 2021(63)**	**PPD,** 27(36.98)	India	21.62±9.25	16(59.26)	6	1-Palmoplantar, 8 (29.63) 2-Common, 9(33.33) 3-Plane, 6 (22.22) 4-Periungual, 2 (7.40) 5-Genital, 2 (7.40)	12.25± 12
		MMR, 25(34.25)		25.37±11.57	18(72)		1-Palmoplantar, 10 (40) 2-Common, 10 (40) 3-Plane, 1 (4) 4-Periungual, 2(8) 5-Genital, 2(8)	12.28±12
		Placebo, 21(28.77)		26.055±11.25	15(71.43)		1-Palmoplantar, 9(42.86) 2-Common,8(38.10) 3-Plane, 2 (9.52) 4-Periungual, 1(4.76) 5-Genital, 1(4.76)	8.235 ± 4
64	**Kaur et.al 2021(64)**	**Mw,** 30(50)	India	28.87±9.17	15(50)	6	Cutaneous warts, 30(100)	11.3 ± 6.02
		MMR, 30(50)		29.43±10.21	16(53.33)		Cutaneous warts, 30(100)	12.32 ± 5.94

Number of sessions, (mean ± SD)	Adverse events, n (%)	Recurrence rate, n (%)	Inclusion criteria	Primary endpoints	Conclusion
Up to 7 sessions	NR	0(0)	1-Patients aged between 12 and 60 years. 2-Presence of extragenital cutaneous warts ≥2. 3-Treatment wash-off period of at least 4 weeks.	1-Compelet response 2-Partial response 3-No response	"The efficacy of immunotherapies was comparable to placebo with minimal side effects."
Up to 7 sessions		0(0)			
Up to 7 sessions		0(0)			
Up to 7 sessions		5 (4%)			
3–4	5(33.33)	1(6.66)	1-All patients, both males and females 2- Clinically diagnosed warts (with no prior treatment with topical or destructive modalities for at least 6 months) were selected for the study.	1-Compelet response 2-Partial response 3-No response	"Intralesional Vit D3, MR vaccine, and PPD are equally efficient in treating verrucae, although Vit D3 can be considered safe."
6–8	0	0(0)			
4	2(13.33)	1(6.66)			
Up to 4 sessions	NR	1(3.70)	1-Clinically diagnosed cases of warts (>1 in number) 2-all ages and genders 3-Consented for the study were included.	1-Compelet response 2-Partial response 3-No response	"Intralesional immunotherapy by both vaccines is a promising, effective, and safe treatment modality with MMR having a slight edge."
Up to 4 sessions		0(0)			
Up to 4 sessions		NR			
Up to 3 sessions	NR	NR	1-Patients aged between 18 and 65 years of both sexes. 2-Patients diagnosed with multiple Cw (>2) based on clinical examination.	1-Compelet response 2-Partial response 3-No response	"MIP intralesional injections have a quicker response and are more efficacious than MMR in treating Cw, though each vaccine carries its side effects."
UpP to 3 sessions		NR			

Table S1. Summary and baseline characteristics of the included studies. *(continued)*

N	Study ID	Study arms, n (%)	Site	Age, (mean ± SD) y	Male, n (%)	Follow-up duration (months)	Type of Warts, n (%)	Warts Duration (months), (mean ± SD)
65	Kolte et.al 2020(65)	**Needling,** 20 (50)	India	28.75±11.86	30(66.66)	NR	1-Common, 28 (70) 2-Plantar,10 (25), 3-Flat warts, 2 (5)	NR
		MMR, 20(50)		29.85±12.44				NR
66	Saha et.al 2022(66)	**MMR,** 30(50)	India	34±10.63	20(66.7)	3	1-Verruca Vulgaris, 18 (60) 2-Plantar wart, 4 (13.33) 3-Others, 8 (26.67)	NR
		MMR SC,30(50)		33.36±9.91	19(63.3)		1-Verruca Vulgaris, 20 (66.67) 2-Plantar wart, 1 (3.33) 3-Others, 9 (30)	NR
67	Nofal et.al 2022(67)	**Oral isotretinoin,** 36(33.33)	Egypt	10.67±7.24	20(55.6)	6	plane warts,36(100)	8.61 ± 6.98
		C.Albicans Ag, 36(33.33)		15.39±11.28	14(38.9)		plane warts,36(100)	10.44 ± 8.24
		C.Albicans Ag and Isotretinoin, 36(33.33)		15.22±9.28	14(38.9)		plane warts,36(100)	8.56 ± 9.07
68	Yaghoobi et.al 2022(68)	**BCG,** 40(50)	Iran	20.5±12.9	15(37.5)	6	common warts, 40(100)	9.7 ± 12.6
		Placebo, 40 (50)		20.22±12.9	14(35)		common warts, 40(100)	5.4 ± 11.7

Number of sessions, (mean ± SD)	Adverse events, n (%)	Recurrence rate, n (%)	Inclusion criteria	Primary endpoints	Conclusion
NR	NR	NR	1-Patients diagnosed with recurrent warts 2-Attending the Dermatology outpatient department in a tertiary healthcare centre was selected.	1-Compelet response 2-Partial response 3-No response	"Needling was observed to be a better treatment modality than the intralesional MMR vaccine at the end of 4 and 6 weeks. More number of sessions were required in the intralesional MMR vaccine for complete clearance of the lesions as compared to needling. Hence, the response was better and faster in the needling as compared to the intralesional MMR."
Up to 3 sessions		NR			
Up to 3 sessions	NR	NR	1-Consenting patients aged between 18 and 65 years. 2-Patients of any gender with two or more viral warts. 3-Patients who did not receive anti-wart treatment in the previous 4 weeks. 4-Absence of any active bacterial or viral skin diseases.	1-Compelet response 2-Partial response 3-No response	"Efficacy and safety profile of Subcutaneous and intralesional MMR were almost same. Both can be considered safe and cost-effective treatment of warts while the subcutaneous route may be easier to administer."
Up to 3 sessions		NR			
Up to 5 sessions	NR	0(0)	1-Patients of both sexes and various age 2-Patients presenting with multiple plane warts of different numbers, sites, sizes, and durations. 3-Patients may have these warts with or without distant warts.	1-Compelet response 2-Partial response 3-No response	"C. Albicans Ag, oral isotretinoin and a combination of both represent potentially effective and safe modalities for the treatment of plane warts, with the C. Albicans Ag alone as the most effective."
Up to 5 sessions		0(0)			
Up to 5 sessions		0(0)			
Up to 8 sessions	NR	0(0)	1-Individual written informed consent for participation in the research was obtained after the study's pur pose, and the study's possible risks and benefits were explained 2-Patients with common warts. 3-No limitations regarding age, sex, number of warts, or disease duration. 4-Patients who had previous BCG vaccinations. 5-Diagnosis of common warts was based on the clinical appearance determined by a dermatologist, with this diagnosis being consistent from the beginning to the end of the study.	1-Compelet response 2-Partial response 3-No response	"Topical BCG vaccine paste was an effective treatment for common warts, without recurrence and significant complications."
Up to 8 sessions		0(0)			

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