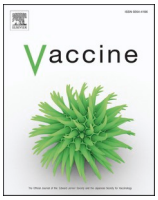
Vaccine 42 (2024) 126199

Contents lists available at ScienceDirect

Vaccine

journal homepage: www.elsevier.com/locate/vaccine



UK paediatricians' attitudes towards the chicken pox vaccine: The SPOTTY study

Elizabeth O'Mahony [a,*], Susan M. Sherman [b], Robin Marlow [c], Helen Bedford [d], Felicity Fitzgerald [e,*]

[a] Imperial College Healthcare NHS Trust, St Marys Hospital, Praed Street, London W2 1NY, United Kingdom
[b] School of Psychology, The University of Sheffield, ICOSS Building, 219 Portobello, Sheffield S1 4DP, United Kingdom
[c] Bristol Royal Hospital, Marlborough Street, Bristol BS2 8HW, United Kingdom
[d] Great Ormond Street Institute of Child Health, University College London, London, WC1N 1EH, UK
[e] Imperial College London, Exhibition Road, London SW7 2AZ, United Kingdom

ARTICLE INFO

Keywords:
Chicken pox
Varicella zoster
Vaccination
Paediatricians
United Kingdom

ABSTRACT

Objectives: An effective vaccine for chicken pox has been included in immunisation schedules since the 1990s. In the UK the recommendation for routine inclusion came in November 2023; it has not yet been implemented. We explored paediatricians' attitudes towards the vaccine and their personal and professional use; as this has been shown to be an influential factor in parents' vaccine decision making.
Methods: We conducted a cross-sectional online survey using a structured questionnaire exploring attitudes and knowledge towards the chicken pox vaccine of UK based paediatricians between June and September 2023.
Results: We received 272 responses, 211 female (78%), 228 based in England (85%) with remainder in Wales (23), Scotland (8) and Northern Ireland (9); 150 (56%) reporting practicing paediatrics <10 years. The majority (n = 207; 78%) agreed that the chicken pox vaccine should be included in the UK routine schedule. Half the cohort, 52% (n = 135), reported having their own children vaccinated against chicken pox, 73% of those with appropriately aged children. Most, 86% (n = 225), recommended the vaccine to family and friends routinely or when asked; however, 42% (n = 108) did not feel able to advise patients' parents due to insufficient information. Of those who do not recommend the vaccine to family and friends, 22 (59%) reported insufficient information to discuss in a professional setting. Of those who did not think it should be included, or were unsure, 38/55 (69%) also felt they had insufficient information to advise parents regarding the vaccine.
Conclusions: Whilst many paediatricians choose to vaccinate their children and agreed the chicken pox vaccine should be added to the routine schedule, the proportion disagreeing is not insignificant. Targeted education to improve paediatricians' knowledge of the chicken pox vaccine and their confidence discussing it should be implemented prior to the national roll out.

1. Background

In the United Kingdom, the chicken pox vaccine was recommended for inclusion in the routine childhood schedule in November 2023, by the Joint Committee of Vaccination and Immunisation (JCVI) [1]. This reversed a previous decision in 2009, when JCVI concluded that it should not be implemented, citing short term cost effectiveness concerns, and a possible increase in herpes zoster and varicella zoster in the adult population [2]. It has therefore only been available in the private sector for the majority of the population, with exceptions for specific populations – non-immune health workers, household contacts of immunocompromised patients – who were eligible for free vaccination within the NHS [3].

Varicella zoster virus (VZV), the causative pathogen for chicken pox, is prevalent across the UK, with previous seroprevalence studies suggesting over 90% of children are exposed by fifteen years of age [4]. The disease burden is often overlooked, due to the perceived expectedness of infection, a perception of mild phenotype and underestimation of social and financial burden to caretakers. It is challenging to quantify, as chicken pox is not a notifiable disease in the UK so estimates may be

* Corresponding authors.
E-mail addresses: elizabeth.omahony2@nhs.net (E. O'Mahony), felicity.fitzgerald@nhs.net (F. Fitzgerald).

https://doi.org/10.1016/j.vaccine.2024.126199
Received 17 May 2024; Received in revised form 30 July 2024; Accepted 30 July 2024
Available online 8 August 2024

incomplete and misrepresentative of some populations, particularly those who access healthcare less frequently.

The World Health Organization (WHO) 2014 position paper on chicken pox describes serious complications including secondary bacterial infections, cerebellar ataxia and encephalitis [5]; encephalitis in particular is associated with neurodevelopmental sequelae [6] which will have additional costs to families as well to society for health, social care and education. Mild disease has a healthcare cost from primary care consultations, with most frequent attendances in the one-to-three-year age group [7]. From 2004 to 2013, the estimated annual varicella hospital admission cost in England was £6.8 million, with the immunocompetent population accounting for 93% [8]– a population in which, if vaccinated, significant disease could be entirely prevented. Across the UK the average cost associated with each chicken pox episode has been estimated at $150 US dollars in a global systematic review of the cost burden of varciella [9].The unseen burden of childhood disease includes the time off required by caregivers and its associated financial implications, as well as interruption to the child's education [10,11]. A recent study looked at health-related quality of life as impacted by chicken pox (both in the community and those hospitalised) – the results suggest significant effect on both children and caregivers, including those managed in the community [12]. This illustrates the importance of considering additional factors when developing vaccination policy; missed school/work days, discomfort and anxiety were all influential on quality of life in both children and carers.

Effective chicken pox vaccines have been used across the globe for nearly three decades, with the USA introducing universal varicella vaccination in 1995 [13], and many European countries following suit in the 2000s. The USA's data are reassuring: no observed increase in herpes zoster cases in adults 25 years post introduction [13], a reduction in paediatric herpes zoster cases particularly in vaccinated children [14], a decline in chicken pox incidence in all groups, and over 50% reduction in varicella related hospitalisations [15]. Data from Germany demonstrate reduced varicella-related hospitalisations, robust vaccine efficacy [16] and a 40% reduction in incidence of varicella related neurological complications [17].

The introduction of new vaccines requires consideration of potential barriers which may detrimentally impact public opinion and thus vaccine acceptance. The UK has a record of successful vaccine introductions, such as rotavirus in 2013 which had good post-introduction coverage reported (94% one-dose and 89% two-doses [18]) and a persistent decrease in laboratory confirmed rotavirus specimens [19]. However, the mass campaigns for the SARS-COV-2 vaccine implementation have been met with far more concerns and vaccine hesitancy has played a much larger role [20]. This change to the vaccine acceptance landscape must be considered in the planning of vaccine introduction in this post pandemic era. Messaging around new vaccines must be transparent and open to ensure families have access to appropriate information and the opportunity to discuss their questions and concerns. Evidence based planning to ensure vaccine introduction material is relevant to those receiving it, and addresses their concerns, is more important than ever. Various studies have demonstrated that the opinions and recommendations of healthcare professionals, including paediatricians, are an important factor in parental vaccine decisions; a nationwide survey on the COVID-19 vaccine rated 'The NHS' and 'Doctors, nurses and healthcare professionals' as the most trusted sources of vaccine information [21]. Another recent survey looking specifically at parental decisions to use the varicella vaccine also cited trust in vaccine/healthcare professionals as a reason to accept the vaccine [22].

A wide range of paediatric healthcare professionals are responsible for delivering vaccinations to children and discussing them with their families. In the UK, routine immunisations are typically given by general practice nurses in dedicated clinics; and these professionals, along with the general practitioners they see regularly need to be able to confidently discuss vaccination choices. Previous work has demonstrated a considerable level of uncertainty regarding the chicken pox vaccine [23] within these professionals, but no previous study addresses the issue within the paediatric trainee or consultant population. Paediatricians' role in addressing questions and concerns from families regarding vaccination choices is just as key to ensuring families can make informed choices, and it sits within the Royal College of Paediatrics and Child Health (RCPCH) curriculum for paediatric training in the UK [24]. Improving paediatricians' vaccine knowledge would increase their confidence in discussing families' questions and concerns around vaccinations when these are raised in routine consultations. Furthermore, providing training on communication skills around vaccination may empower them to discuss the topic when appropriate, for example following taking a routine immunisation history that reveals gaps in the record. This could increase the volume of conversations around vaccination and thus the opportunities for families to have outstanding concerns and questions answered. This aligns with the NHS and Public Health England consensus statement: Make Every Contact Count (MECC) - which recommends this approach be carried out across health and social care organisations [25]. MECC centres around use of opportunistic interactions to support individuals to make positive changes to their lifestyle; in the context of vaccination, it can mean a consistent approach to offering information, inviting questions, signposting to reliable resources and reminders that it is never too late for vaccinations to begin or restart. The RCPCH position statement on vaccination supports this concept, stating where vaccines are not up to date reasons should be established and appropriate intervention offered [26] – this proactive approach is key to supporting ongoing vaccination but especially for new vaccines and campaigns.

Despite the role they play in providing advice and support to parents, there have been no studies to date which have investigated UK paediatric doctors' attitudes and knowledge towards the chicken pox vaccine. In the current study, we therefore investigated paediatricians' attitudes towards the chicken pox vaccine in both personal and professional practice, prior to recommendation for introduction to the national schedule. We use these data to explore paediatricians' current knowledge regarding chicken pox vaccination, identify any possible knowledge gaps and suggest interventions that could be implemented to optimise the impact of the new vaccine roll out.

2. Methods

2.1. Survey development

Our overarching research question "Do paediatricians use and recommend the chicken pox vaccine?" was used to create the questionnaire through a series of investigator focus groups. These included the five investigators within which there was clinical expertise from both a consultant and trainee level, previous research experience into varicella attitudes and substantial experience within vaccine knowledge, attitudes and opinion research overall. Questions were initially drafted after discussion, and then refined over a series of meetings. Within the questionnaire, we collected information regarding the participants' personal (e.g. If you have children under the age of 18 years, have you chosen to have them vaccinated against chicken pox?) and professional use of the vaccine (e.g. Do you feel that you have access to sufficient information about the chicken pox vaccine to be able to advise patients' parents?) as well their opinion on routine inclusion (e.g. Do you think the chicken pox vaccine should be included in the childhood vaccination schedule in the UK?). We asked about their occupational exposure (e.g. How often do you manage complications of chicken pox?) and their self-reported knowledge (e.g. Do you feel that you have access to sufficient information about the chicken pox vaccine to be able to advise patients' parents?). Additional questions included their thoughts on the reception of the introduction of the vaccine (e.g. If the chicken pox vaccine were included in the routine schedule, how many families do you think would accept it?) and preferred delivery (e.g. If the vaccine were included in

the routine schedule, which delivery do you think would achieve the best uptake from parents?). Categorical responses (e.g. yes, no, unsure) and Likert type scales were used to quantify opinions and practices, and, where relevant, free text questions were used to draw out further detail. Key demographics such as length of training and gender were collected, but any potentially identifying demographics, such as sub-speciality training or specific region were avoided. The questionnaire was digitalised using Qualtrics software. The study was approved by the Imperial Ethics Committee (ICREC: 6565710).

2.2. Recruitment

Data were collected from a convenience sample, as per previous survey studies [23], of around 270 respondents, directly into Qualtrics™ from UK-based doctors working in paediatric settings. The survey was advertised though the RCPCH Research Bulletin, RCPCH magazine 'Milestones', British Paediatric Allergy, Infection & Immunity Group news bulletin as well as local paediatric training and subspecialty networks. On opening the survey either through a URL link, or QR code, potential participants had to review the Participant Information Sheet and give consent prior to proceeding to the survey. Participants were informed that as data were anonymised, withdrawal of their information after having completed the survey would not be possible. Participants were those working in secondary care paediatric settings for any length of time; those working in community settings were not targeted.

2.3. Statistical analysis

Summary statistics were calculated to describe the demographics of the whole cohort, as well as separated by answers to key questions. Chi-squared tests of independence were conducted to assess the relationships between certain variables and specific answers. The hypotheses and results of these are reported in the results section. The threshold for statistical significance was set at $p < .05$.

2.4. Thematic analysis

Free text responses with discrete answers, such as chicken pox complications, were analysed by a frequency count to rank complications by how often they were mentioned. [27]Thematic analysis was used to summarise the opinions and attitudes voiced within the responses to open ended questions, by identifying codes and grouping these into themes. These codes were extracted by a single user, and then reviewed by all authors. A full set of codes is available listed by question within the supplementary material.

3. Results

A total of 272 survey responses were collected from June to September 2023. Most respondents (78%, 211) were female, 21% (57) male and 0.4% (1) non-binary. The majority of respondents were working in England (228, 85%) with a small proportion from Wales, Scotland and Northern Ireland. There was a range across length of training with the majority (73%, 195) in the mid-range of 5–20 years of paediatric experience. Table 1 summarises the demographics of the survey respondents, along with responses to three main questions according to these demographics.

Across the cohort, 78% (207/264) agreed the chicken pox vaccine should be included in the national schedule, with only 8% (22/264) disagreeing and the remainder responding 'Don't know'. Of those (183/272) with appropriately aged children, 73% (135/183) reported having had them vaccinated against chicken pox; 115 (85%) purchased the vaccine privately.

A Chi-Square Test of Independence was performed to assess the relationship between those reporting insufficient information to advise parents and those with less than ten years of paediatric experience. There was a significant relationship between these variables, $X^2(1, 257) = 7.70$, $p = .01$, meaning those with less than ten years of paediatric experience were more likely to report having insufficient information to advise parents.

The proportion of respondents feeling they had access to sufficient information increased with increasing time in paediatric training, however at least 30% of each time in practice cohort still answered negatively as shown in Fig. 1.

A Chi-Square Test of Independence was performed to assess the relationship between opinion that the chicken pox vaccine should be included on the national schedule and those with less than ten years of paediatric experience. There was no significant relationship between these variables, $X^2(1, 263) = 0.42$, $p = .52$, meaning there was no association between length of paediatric experience and opinion on inclusion of the chicken pox vaccine in the national schedule.

Another Chi-Square Test of Independence was performed to assess the relationship between those reporting access to sufficient information to have discussions with parents, and those who recommended the chicken pox vaccine to family and friends when asked. There was a significant relationship between these variables, $X^2(1, 257) = 5.39$, $p = .02$, meaning those reporting sufficient information to discuss with parents were more likely to recommend the chicken pox vaccine to family and friends when asked.

Overall, the majority (225, 85%) would recommend to family and friends if asked, however of these, only 60% (134/225) felt they had sufficient information to advise patients and families, suggesting less reluctance for personal discussions than those in a professional context.

Most, (193, 75%) thought that over 80% of parents would accept the chicken pox vaccine if offered routinely with 58% (150/256) thinking the combined Measles Mumps Rubella Varicella vaccine (MMRV) would achieve the highest uptake compared with the chicken pox vaccine given separately from the MMR vaccine. Of the respondents who felt fewer than 80% of parents would accept the vaccine, more responded 'No' or 'Don't know' when asked whether the vaccine should be included in the routine schedule (40%, 26/65), compared to 15% (29/193) of those who felt at least 80% families would accept the vaccine.

Table 1
Demographics of the survey respondents and their question responses.

Characteristic		Gender			Location				Paediatric experience (years)			
	Number (%)	Male	Female	Non-binary	England	Wales	Scotland	Northern Ireland	<5	5–10	10–20	>20
Responses	272	57 (21%)	211 (78%)	1 (0.4%)	228 (85%)	23 (9%)	8 (3%)	9 (3%)	44 (17%)	106 (40%)	89 (33%)	27 (10%)
Chicken pox should be included in routine vaccination schedule	207 (78%)	44/56 (79%)	162/ 207 (78%)	1/1 (100%)	174/225 (77%)	21/23 (91%)	4/7 (57%)	7/8 (88%)	32/42 (76%)	81/105 (77%)	75/89 (84%)	18/27 (67%)
Recommend vaccine to family and friends	225 (85%)	46/56 (82%)	178/205 (86%)	1/1 (100%)	191/224 (85%)	22/23 (96%)	4/6 (67%)	7/8 (88%)	34/41 (83%)	94/104 (90%)	78/89 (88%)	18/27 (67%)
Insufficient information to advise parents	108 (42%)	19/54 (35%)	89/202 (44%)	0/1 (0%)	93/221 (44%	9/23 (39%)	4/6 (67%)	2/7 (29%)	21/39 (54%)	50/104 (48%)	29/88 (33%)	8/26 (31%)

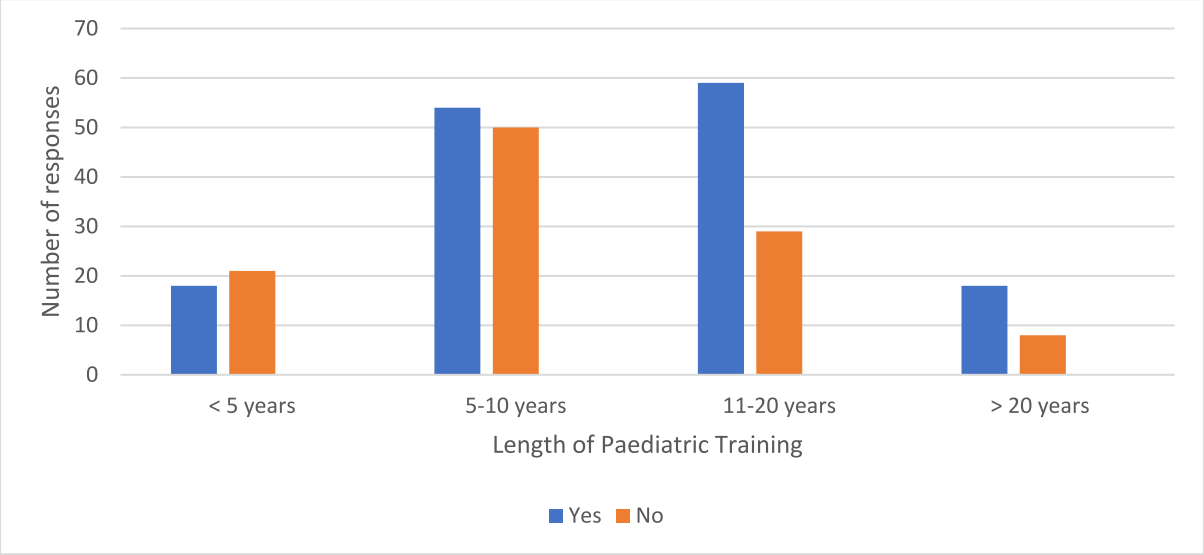


Fig. 1. Respondents' assessment of their access to sufficient information to advise parents about the chicken pox vaccine by length of time in paediatric training.

Of those who reported managing chicken pox complications daily or weekly, 90% (19/21) thought the chicken pox vaccine should be included in the national schedule with 95% (20/21) recommending it to family and friends if asked. Of those who reported managing these complications less than yearly, 63% (25/40) believed it should be added to the schedule and 80% (32/40) recommended to family and friends if asked.

Overall, 42% of respondents considered there to be no downsides to the inclusion of the chicken pox vaccine in the national schedule, whilst 31% felt there were downsides and 27% were unsure. Across these groups the rate of agreement that the chicken pox vaccine should be included in the national schedule varied from 96% (99/103, 'No Downsides') to 68% (52/77, 'There are downsides'). Those unsure if there were downsides, fell between the two with 64% (42/66) agreeing the chicken pox vaccine should be included in the schedule, 12% disagreeing and 24% answering 'Don't know'.

3.1. Thematic analysis

In response to open ended questions, a wide range of complications of chicken pox were described the most frequently mentioned were encephalitis (64), invasive Group A Streptococcus infection (43), secondary bacterial infection (29) and necrotising fasciitis (26). A full list of complications mentioned by frequency is shown in Supplementary Table 1.

Reported downsides, or lack thereof, to the introduction of the vaccine were analysed grouped by root answer to 'Do you think there are any downsides', answered either "Yes", "No" or "Unsure". Of those who answered 'Yes' waning immunity and increased shingles risk were the most commonly mentioned, followed by parental vaccine hesitancy. In those answering 'No', the lack of evidence of waning immunity was quoted in support of the vaccine as the second most common answer, with evidence from it working well in other countries as the most frequent. Topics from those answering 'Unsure' reasons were similar, focused on a reduced immunity duration. The detailed codes for all responses categorised by theme are described in Table 2.

Analysis of additional comments made at the end of the questionnaire repeated similar themes elicited from previous questions, with an emphasis on wanting to avoid complications and severe illness for children. Concerns over health inequity, insufficient education for healthcare professionals, and the possible impact on MMR uptake were also mentioned. A full list of thematic codes produced for each question are listed in Supplementary Table 2.

Table 2
Categorisation of thematic analysis codes obtained from free text answers to 'Do you think there are any downsides to introducing the chicken pox vaccine?' split by root answer (Yes there are downsides, No there are not downsides or Unsure).

Theme	Code	Response Frequency Count		
		Yes -there are downsides to vaccine introduction	Unsure	No – there are no downsides to vaccine introduction
Severity of illness	Chicken pox is a self-limiting/mild disease	1	2	
	We should prevent severe illness or complications from chicken pox		–	3
Natural immunity	There is reduced immunity in adults/increased shingles risk	30	23	
	May need a booster later in life	2	6	
	Will leave women vulnerable to infection in pregnancy	10	4	
	There is no evidence for reduced immunity in adulthood		1	8
Vaccine uptake	May worsen vaccine hesitancy	23	6	3
	May reduce the MMR impact if combined	6	1	3
Available evidence	Don't have enough information		5	
	Unsure if would be cost effective	14	4	3
	Evidence that it works well in other countries			14
	Evidence that combined MMRV increases rates of febrile convulsions	1		2

4. Discussion

This timely study is, to our knowledge, the only one to focus on UK paediatric doctors' attitudes and knowledge towards the chicken pox vaccine. Conducted shortly before the JCVI November 2023 announcement, it demonstrates that most paediatricians support the introduction of the VZV vaccine to the national schedule, but many do not feel well informed enough to advise patients about it. This is a key finding given the anticipated nationwide roll-out of the vaccine following the JCVI announcement. The demographics of this sample are representative of paediatricians across the United Kingdom with respect to gender, as per the 2019 RCPCH report (77% paediatric trainees and 54% of paediatric consultants were reported as female) [28]. The sample is concentrated around those with 5–20 years of paediatric experience which may reflect both the methods of recruitment, as well as those more interested in the subject as they may have children of an appropriate age to have considered vaccination. Geographically, the sample is far more representative of England compared to the other countries within the United Kingdom, and this is likely due to recruitment and advertisement bias.

Most paediatricians we surveyed chose to purchase the vaccine for their children and recommend it to their own family and friends (particularly when asked), despite many feeling that they didn't have sufficient information to advise patients' families, suggesting a higher bar of confidence required for conversations in a professional setting than a personal one.

The spread of reporting access to insufficient information across length of training groups, including up those practicing for >20 years, suggests the topic is not adequately covered in current paediatric training or continuing professional development. This is further illustrated by thematic analysis drawing out themes around having insufficient information about the vaccine. This is compounded by the scarcity of mention of the slight increase in febrile convulsions noted with the combined MMRV (Measles, Mumps, Rubella & Varicella) vaccine [29]. This was a key factor in the JCVI discussion and recommendation around the vaccine introduction; the final decision being to advise for the combined vaccine due to only a small increase and the benign nature of febrile convulsions. However, an important caveat is that parents and carers need to be appropriately informed and consented of this risk which relies on a strong knowledge base of the healthcare professionals providing vaccinations. As a possible area of concern for families, this should be one area focused on when educating paediatricians around the chicken pox vaccine introduction and its characteristics.

The training needed is two-fold: objective knowledge about this specific vaccine and the communication skills to discuss vaccines in general with families, especially where there are reservations and concerns. Whilst most immunisation takes place in primary care, paediatricians should be empowered to discuss vaccines opportunistically with patients' families, in line with the NHS consensus 'Making Every Contact Count' [30], which is reiterated in NICE guidance [31], the NHS vaccination strategy [32] and the RCPCH position statement on vaccination [26]. Paediatricians of all training grades should be equipped to discuss the vaccination programme with confidence, and to have effective conversations around vaccination choices to support parental decision making. Targeted paediatrician education as one strand of the national introduction could have a positive impact on tackling vaccine hesitancy and empowering paediatricians to feel comfortable having these conversations with patients and families. This education could be delivered both nationally through lectures and using spaces such as the RCPCH conference, as well as locally through departmental teaching sessions. The inclusion in the RCPCH curriculum of discussing vaccine hesitancy [24] confirms its importance is already recognised, and therefore actualising this learning objective should be a priority.

Previous research exploring parental views of the chicken pox vaccine, reported around three quarters would be likely to accept it for their children if offered [22]. It also highlighted parental concerns are not dissimilar to paediatricians' including perceiving chicken pox to be a mild illness and preferring natural immunity. However, this parental survey was not focused on populations known to have low vaccine uptake, so may not fully represent the likely uptake of the vaccine. A study interviewing mothers of adolescents unvaccinated against HPV demonstrated some key concerns: lack of education around benefits of the vaccine, perception of low risk to their child and language barriers around communication material [33]. This should be used to inform the development of educational resources; for parents to be able to access, and healthcare professionals to be able to address these concerns adequately. The importance of parental acceptance was a frequent theme within the free text responses, quoted as a concern regarding vaccine uptake, and the impact a combined vaccine could have on MMR (Measles, Mumps, Rubella) uptake. Further research on concerns about vaccination, specifically amongst groups known to have low vaccination rates, is needed to ensure messaging and interventions remain relevant and effective.

The survey responses also revealed paediatricians' concern about the health inequities widened by vaccines being privately available prior to national introduction; 40% (348/861) of reasons listed for supporting the vaccine introduction were based on inequity (cost, access or awareness). Whilst the VZV vaccine has now been recommended for the national schedule, this demonstrates that the inequity caused by privately available vaccines is of concern to the paediatrician population. This could become a recurrent issue as new vaccine development accelerates and national inclusion may not be financially feasible for every product. Widespread education about approved vaccines, even those not yet on the national schedule, would allow paediatricians to advocate for their patients and work against the current health inequities within the UK. The effect of private vaccine purchase on deepening child health inequity should be carefully considered as new vaccines are licenced if they are not included on the routine schedule.

5. Study limitations

This survey provides insight at an important time for the chicken pox vaccine in the UK, however there are some limitations. Our focus was on paediatricians, who are just one part of the workforce surrounding vaccination, and therefore should be used in conjunction with other studies which have looked at other health professional groups [23] and found lower agreement for the vaccine introduction. The sample size is not insignificant, but within the large cohort of UK paediatricians, it may be that there are increased responses from those with strong opinions and the average view is less well represented. In particular, responses were concentrated in England, likely due to recruitment methods and word of mouth. Studies have shown that where the researcher(s) are known to the population this can aid recruitment [34], but this has the potential to cause bias by over-recruiting from a like-minded subset. The use of messaging application platforms, such as Whatsapp, has been discussed in more recent literature as an effective method for recruitment and data collection in certain populations. There are caveats around this however, including concerns about the perception of messaging apps as a private space and exclusion of certain populations with restricted access. Further studies into the use of messaging applications in all areas of research will continue to inform researchers on the most appropriate and effective inclusions within their work.

6. Conclusion

Paediatricians in the UK are not well prepared to discuss the VZV vaccine with families, and in light of its national introduction, this must be addressed promptly. Appropriate education and training of all paediatric healthcare professionals will support the introduction and effective vaccine roll out of this vaccine programme and is notably needed to meet the RCPCH curriculum requirements. Healthcare professionals' opinions have been shown to be an important factor in

vaccination decision making, and so using these survey results to demonstrate the high uptake of the vaccine amongst paediatricians' for their own children may be a useful public message to support the vaccine introduction.

Authorship statement

All authors attest they meet the ICMJE criteria for authorship.

The study was approved by the Imperial Ethics Committee (ICREC: 6565710).

CRediT authorship contribution statement

Elizabeth O'Mahony: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Project administration, Writing – original draft, Writing – review & editing. **Susan M. Sherman:** Conceptualization, Formal analysis, Methodology, Supervision, Writing – review & editing. **Robin Marlow:** Conceptualization, Supervision, Writing – review & editing. **Helen Bedford:** Conceptualization, Supervision, Writing – review & editing. **Felicity Fitzgerald:** Conceptualization, Project administration, Supervision, Writing – review & editing.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data will be made available on request.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.vaccine.2024.126199.

References

[1] Department of Health and Social Care. JCVI statement on a childhood varicella (chickenpox) vaccination programme. https://www.gov.uk/government/publications/childhood-varicella-vaccination-programme-jcvi-advice-14-november-2023/jcvi-statement-on-a-childhood-varicella-chickenpox-vaccination-programme; 2024.

[2] The National Archives. JCVI meeting 2009 minutes - 14 October 2009. https://webarchive.nationalarchives.gov.uk/ukgwa/20130107105354/http://www.dh.gov.uk/prod_consum_dh/groups/dh_digitalassets/@dh/@ab/documents/digitalasset/dh_109874.pdf; 2009.

[3] UKHSA. The green book: Varicella. 2019.

[4] Nardone A, et al. The comparative sero-epidemiology of varicella zoster virus in 11 countries in the European region. Vaccine 2007;25:7866–72.

[5] World Health Organisation. Varicella and herpes zoster vaccines: WHO position paper. Wkly Epidemiol Rec 2014;89:265–88.

[6] Khandaker G, et al. Long-term outcomes of infective encephalitis in children: a systematic review and meta-analysis. Dev Med Child Neurol 2016;58:1108–15.

[7] Walker JL, Andrews NJ, Mathur R, Smeeth L, Thomas SL. Trends in the burden of varicella in UK general practice. Epidemiol Infect 2017;145:2678–82.

[8] Hobbelen PHF, Stowe J, Amirthalingam G, Miller L, van Hoek A-J. The burden of hospitalisation for varicella and herpes zoster in England from 2004 to 2013. J Inf Secur 2016;73:241–53.

[9] Williame I, et al. Healthcare resource use and costs of varicella and its complications: a systematic literature review. Hum Vaccin Immunother 2023;19.

[10] Banz K, Wagenpfeil S, Neiss A, Hammerschmidt T, Wutzler P. The burden of varicella in Germany. Eur J Health Econ 2004;5:46–53.

[11] Widgren K, Giesecke J, Lindquist L, Tegnell A. The burden of chickenpox disease in Sweden. BMC Infect Dis 2016;16:666.

[12] Rodrigues F, et al. Prospective study of loss of health-related quality adjusted life years in children and their families due to uncomplicated and hospitalised varicella. Vaccine 2023;41:1182–9.

[13] Marin M, Seward JF, Gershon AA. 25 years of varicella vaccination in the United States. J Infect Dis 2022;226:S375–9.

[14] Weinmann S, et al. Incidence of herpes zoster among children: 2003–2014. Pediatrics 2019;144.

[15] Bialek SR, et al. Impact of a routine two-dose varicella vaccination program on varicella epidemiology. Pediatrics 2013;132:e1134–40.

[16] Varela FH, Pinto LA, Scotta MC. Global impact of varicella vaccination programs. Hum Vaccin Immunother 2019;15:645–57.

[17] Streng A, Grote V, Rack-Hoch A, Liese JG. Decline of neurologic varicella complications in children during the first seven years after introduction of universal varicella vaccination in Germany, 2005–2011. Pediatr Infect Dis J 2017;36:79–86.

[18] Public Health England. National Rotavirus Immunisation Programme Update: Preliminary Vaccine Coverage for England, February 2016 to July 2016. https://assets.publishing.service.gov.uk/media/5a7f9aaa40f0b62305b88277/hpr3216_rtvrs_VC.pdf; 2016.

[19] Public Health England. PHE National Norovirus and rotavirus report. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/878578/Norovirus_update_2020_weeks_12_to_13.pdf; 2020.

[20] Grills LA, Wagner AL. The impact of the COVID-19 pandemic on parental vaccine hesitancy: a cross-sectional survey. Vaccine 2023;41:6127–33.

[21] Stead M, et al. National survey of attitudes towards and intentions to vaccinate against COVID-19: implications for communications. BMJ Open 2021;11:e055085.

[22] Sherman SM, Lingley-Heath N, Lai J, Sim J, Bedford H. Parental acceptance of and preferences for administration of routine varicella vaccination in the UK: a study to inform policy. Vaccine 2023;41:1438–46.

[23] Sherman SM, Allerton-Price C, Lingley-Heath N, Lai J, Bedford H. UK healthcare professionals' attitudes towards the introduction of varicella vaccine into the routine childhood vaccination schedule and their preferences for administration. Vaccine 2024;42:2621–7.

[24] RCPCH. Progress plus: core syllabus for paediatric training. 2023.

[25] NHS England. Making Every Contact Count(MECC): consensus statement. https://www.england.nhs.uk/publication/making-every-contact-count-mecc-consensus-statement/; 2024.

[26] RCPCH - Health Policy Team. Vaccination in the UK - position statement. https://www.rcpch.ac.uk/resources/vaccination-uk-position-statement; 2020.

[27] Stemler S. An overview of content analysis. Pract Assess Res Eval 2000;7(1):17.

[28] RCPCH. Workforce Census: UK Overview Report (2019). https://www.rcpch.ac.uk/resources/workforce-census-uk-overview-report-2019; 2019.

[29] Casabona G, Berton O, Singh T, Knuf M, Bonanni P. Combined measles-mumps-rubella-varicella vaccine and febrile convulsions: the risk considered in the broad context. Expert Rev Vaccines 2023;22:764–76.

[30] Public Health England. Making Every Contact Count (MECC): Consensus Statement. https://www.england.nhs.uk/wp-content/uploads/2016/04/making-every-contact-count.pdf; 2016.

[31] National Institute of Clinical Excellence. Vaccine uptake in the general population. https://www.nice.org.uk/guidance/ng218; 2022.

[32] NHS England. NHS Vaccination Strategy. https://www.england.nhs.uk/long-read/nhs-vaccination-strategy/; 2023.

[33] Fisher H, et al. Information needs of ethnically diverse, vaccine-hesitant parents during decision-making about the HPV vaccine for their adolescent child: a qualitative study. BMC Public Health 2024;24:91.

[34] Negrin KA, Slaughter SE, Dahlke S, Olson J. Successful recruitment to qualitative research: a critical reflection. Int J Qual Methods 2022;21:160940692211195.