

The two-dose measles, mumps, and rubella (MMR) immunisation schedule: factors affecting maternal intention to vaccinate

MANISH PAREEK

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SUMMARY

Background. In the light of sub-optimal uptake of the measles, mumps, and rubella (MMR) vaccination, we investigated the factors that influence the intentions of mothers to vaccinate.

Method. A cross-sectional survey of 300 mothers in Birmingham with children approaching a routine MMR vaccination was conducted using a postal questionnaire to measure: intention to vaccinate, psychological variables, knowledge of the vaccine, and socioeconomic status. The vaccination status of the children was obtained from South Birmingham Child Health Surveillance Unit.

Results. The response rate was 59%. Fewer mothers approaching the second MMR vaccination (Group 2) intended to take their children for this vaccination than Group 1 (mothers approaching the first MMR vaccination) (Mann-Whitney $U = 2180$, $P < 0.0001$). Group 2 expressed more negative beliefs about the outcome of having the MMR vaccine ('vaccine outcome beliefs') (Mann-Whitney $U = 2155$, $P < 0.0001$), were more likely to believe it was 'unsafe' ($c^2 = 9.114$, $P = 0.004$) and that it rarely protected ($c^2 = 6.882$, $P = 0.014$) than Group 1. The commonest side-effect cited was general malaise, but 29.8% cited autism. The most trusted source of information was the general practitioner but the most common source of information on side-effects was television (34.6%). Multiple linear regression revealed that, in Group 1, only 'vaccine outcome beliefs' significantly predicted intention (77.1% of the variance). In Group 2 'vaccine outcome beliefs', attitude to the MMR vaccine, and prior MMR status all predicted intention (93% of the variance).

Conclusion. A major reason for the low uptake of the MMR vaccination is that it is not perceived to be important for children's health, particularly the second dose. Health education from GPs is likely to have a considerable impact.

Keywords: measles; mumps; rubella; vaccine; MMR; immunisation; mother; patient attitudes; patient beliefs; autism; Crohn's disease.

Introduction

It has been reported that the uptake of measles, mumps, and rubella (MMR) vaccination has fallen¹ since the publication of the hypothesis proposed by Wakefield and colleagues² of a link between the MMR vaccination and Crohn's disease and autism. This fall has been attributed to the media attention given to the

hypothesis³ and it is feared that the publication of two reports^{4,5} that have found no evidence for the hypothesis will fail to receive as much media attention. However, the links between media coverage of possible side-effects, public perceptions of the vaccination, and the fall in uptake are speculative. The communication of risk and the effects of that communication on behaviour are complex, relating both to individual cognition and to social and cultural factors, including the perceptions of the communicator.⁶

To date, very little research has been carried out on reasons for variation in uptake of the MMR vaccination. Although previous work using the theoretical context of health behaviour models has given us insights into vaccination behaviour (for example, the work of Peckham, 1989⁷), it is important to research the MMR vaccination because it differs from other vaccinations studied in two important respects. First, the current United Kingdom two-dose MMR schedule⁸ means that parents are being asked to consent to a second dose, which is possibly unnecessary for their child, at a time when they have less contact with primary care professionals in regard to the health of their child than in babyhood. Secondly, the MMR vaccination provides protection against diseases common in the childhood of today's parents, which may lead to lower perceived severity. The current two-dose schedule will achieve virtually 100% protection *only* if there is uniform coverage of 95% of both vaccines.⁹ For British children who were five years old in the final quarter of 1999, first-dose MMR coverage is 93% while second-dose coverage is only 75.9%.¹⁰

Using the theoretical framework of the Theory of Planned Behaviour,¹¹ we carried out a survey to assess the factors that influence mothers' intentions to have their children vaccinated. We chose to study intentions so as to provide an insight into the decision-making process and thus inform educational interventions. We compared mothers of five- to 12-month-old children (those with children coming up to the first MMR vaccine) with mothers of 21- to 35-month-old children (those with children coming up to the second MMR vaccine).

Method

A prospective cross-sectional survey was conducted using a pre-piloted questionnaire. Eight general practices in south Birmingham agreed to take part in the study and gave written consent for Birmingham Health Authority to release confidential information for all children aged between five and 12 months (prior to the first MMR vaccine) and between 21 and 35 months (prior to the second MMR vaccine). From the sampling frames provided by the health authority, twins were excluded and the mothers who had children in both the five- to 12-month-old and the 21- to 35-month-old cohorts were excluded from the 21- to 35-month-old-cohort. This left a total of 219 mothers of children in the five- to 12-month-old-cohort (Group 1) and 620 mothers of children in the 21- to 35-month-old cohort (Group 2). One hundred and fifty from each group were randomly selected to participate in the study. The mothers were sent a 48-item questionnaire, covering letters from the investigators and the child's general practitioner, and a reply-paid envelope in which to return

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the questionnaire. Confidentiality of the information they gave from their general practice and any health authority personnel was assured. Two mailings of the questionnaire were sent (further mailings were not possible because of the proximity of the MMR vaccination decision).

The questionnaire had three sections. The first section asked about psychological factors likely to be related to vaccination behaviour¹¹ with responses given on five-point Likert-type scales (1 = 'strongly agree'; through to 5 = 'strongly disagree'):

- attitudes to vaccination, e.g. 'How safe do you think the MMR vaccine is?';
- attitudes to the diseases prevented, e.g. 'How serious do you feel measles is?';
- beliefs about the outcome of vaccination and evaluation of these ('vaccine outcome beliefs'), e.g. 'Vaccinations protect my child against the diseases measles, mumps and rubella';
- beliefs about others' attitudes to vaccination and the motivation to comply with these, e.g. 'My GP wants my child to have the MMR vaccine'; and
- beliefs about the ability to obtain vaccination and external obstacles or opportunities involved, e.g. 'Taking my child for vaccinations is very easy'.

The second section covered other issues pertaining to the MMR vaccine, including maternal knowledge about the MMR schedule, adverse effects, and contraindications. It also asked mothers where they obtained information from about the MMR vaccine and its side-effects and whose opinion they valued in making a decision to immunise. The third section obtained sociodemographic information from the mothers, including their age, occupational class, educational qualifications, marital status, and ethnic group. Data analysis was conducted using the SPSS package,¹² and for all tests significance was set at $P < 0.05$.

Participants

Responses were received from 173 out of 295 mothers (five were returned as the mothers had moved away), giving a response rate of 58% for Group 1 and 60% for Group 2 (59% overall). Of the responders, 85.6% described their ethnic background as white, 3.5% as African Caribbean, and 8.7% as Indian or Pakistani. This represents a slightly higher proportion of white women than the proportion in Birmingham as a whole (78.2%), and a slightly lower proportion of African Caribbean and Indian or Pakistani (4.7% and 12.4% respectively).¹³ The socioeconomic profile of the responders (measured by occupation and educational level) showed a very similar profile to that in national surveys of women in this age group.^{14,15} Group 1 did not significantly differ from Group 2 in ethnicity or socioeconomic status.

Results

There was no significant difference between the responders and non-responders in Group 1 or Group 2 in terms of vaccination coverage. According to South Birmingham Child Health Surveillance Unit (CHSU) data, 89.5% of the children of Group 1 and 94.3% of the children of Group 2 had received their complete course of primary vaccinations by the age of six months. Of the Group 2 children, 91.5% had received their first MMR vaccine by the age of 21 months. The mothers who did not have their child vaccinated with the first MMR dose all cited 'fear of vaccine' as their reason for this.

The age when the first MMR vaccine is given was known to 62.4% of mothers and 69.9% knew when the second MMR vaccine is given. There were no differences between Groups 1 and 2. Nearly half the responders (48.6%) said that the vaccine did cause side-effects and a further 32.9% were unsure, with no sig-

nificant difference between the two groups. Mothers generally had good levels of knowledge about the adverse effects caused by the MMR vaccine, with general malaise the most commonly cited side-effect in response to an open question — 44.2% in Group 1 and 58.5% in Group 2. However, there was evidence that the media have left a lasting impression on mothers, with 29.8% saying that the vaccine caused autism, and 13.1% saying it caused Crohn's disease, again in answer to an open question without prompts. Group 2 mothers were significantly more likely to say that the vaccine causes serious neurological effects ($\chi^2 = 6.267$, $df = 1$, $P = 0.016$). A high proportion of mothers (41.1%) said that there are valid contraindications to the MMR vaccine, most commonly citing 'child unwell at time of vaccine'. However, there was also evidence of misinformation with a substantial proportion (27.7%) citing invalid contraindications, e.g. 'adverse reactions to previous vaccines for family members'.

Mothers consulted a wide variety of sources to obtain general information about the MMR vaccine, including health professionals, friends, family, and the media. In both groups the commonest source of general vaccine information was the health visitor (77.9% in Group 1 and 76.7% in Group 2). In contrast, mothers predominantly acquired their information about the side-effects of the MMR vaccine from various sections of the media rather than from health professionals, with television the most commonly cited source of information about side-effects (31.4% in Group 1 and 37.9% in Group 2). Nevertheless, mothers in both groups still valued the opinion of their GP most in making a decision to immunise. Group 2 mothers were significantly more likely than Group 1 mothers to value their own opinion as very important ($\chi^2 = 7.128$, $df = 1$, $P = 0.011$).

Mothers generally felt that the three vaccine-preventable diseases (measles, mumps, and rubella) were serious, with measles perceived to be most serious disease (50.9% said it was 'very serious') and mumps the least serious (36.1% felt it was 'very serious'). Although the majority of mothers felt that the MMR vaccine was 'very safe' or 'safe' (76.5%), the two groups differed in their perception of its safety, with 8.1% of Group 1 mothers agreeing that the MMR vaccine was 'very unsafe' or 'unsafe' in comparison with 25.3% of Group 2 mothers ($\chi^2 = 9.114$, $df = 1$, $P = 0.004$). Similar significant differences emerged in their perception of the vaccine's efficacy, with 9.3% of Group 1 mothers and 24.1% of Group 2 mothers saying that the vaccine 'rarely protected' ($\chi^2 = 6.882$, $df = 1$, $P = 0.014$). Group 2 mothers also had significantly more negative 'vaccine outcome beliefs' about the MMR vaccine than Group 1 mothers (Mann-Whitney $U = 2154.5$, $z = -3.528$, $P < 0.0001$). This implies that they were less likely to believe that the vaccine protected their child from disease and/or that this was an important outcome.

Group 2 mothers had significantly lower intentions to take their child for the second MMR vaccine than Group 1 mothers had to take their child for the first MMR vaccine (Mann-Whitney $U = 2180$, $z = -3.823$, $P < 0.0001$). Multiple linear regression of the factors predicting intention for each age group revealed that in Group 1 the sole significant predictor of intention was 'vaccine outcome beliefs', which accounted for 77.1% of the variance in the intention score. In Group 2, three factors significantly predicted intention: 'vaccine outcome beliefs', attitude to MMR vaccine, and prior MMR status (i.e. first MMR status) that together accounted for 93% of the variance in intention.

Discussion

Mothers in Birmingham whose children were scheduled to have the MMR vaccine generally possessed good levels of knowledge about various facets of the MMR vaccine and mainly expressed

positive opinions about it. However, there was evidence, in some of the mothers' responses, that adverse publicity about the MMR vaccine has left a lasting impression. Hence a minority do not trust the safety of the vaccine and are unsure about possible side-effects of the vaccine. Furthermore, a minority of mothers, of older children especially, doubt the efficacy of the vaccine and its benefit to their child.

Despite the good level of knowledge and generally positive attitudes about the vaccine, uptake of the first and second MMR vaccine is predicted to be sub-optimal in this population — 87% of Group 1 mothers intended to take their child for first MMR and only 78% of Group 2 mothers intended to take their child for second MMR. This is further evidence that the two-dose schedule, which requires 95% uptake of each dose, may be failing. There is a small group of mothers who will not take up either dose and for them the safety of the vaccine is of primary importance. However, the two groups significantly differed in their intention to have their child immunised because they differed in the degree to which they believed it is important and necessary.

Exposure to the extensive media coverage of concerns about the MMR vaccine does not explain the difference between the groups. One interpretation of these findings is that Group 2 mothers are not only concerned about the safety of the vaccine but also question the importance and necessity of the second dose. This group had less contact with health professionals and expressed more confidence in their own judgement. So the views of the media and others outside the health services may have more influence on vaccination behaviour in mothers of older children. It may also be that they perceived their (older) children as less vulnerable to the effects of disease.

Non-responders did not differ from responders in vaccination uptake and responders seem to be representative of the population, nevertheless some caution should be exercised in generalising from a relatively small sample. With that caveat, the findings of this study have important implications for the health service because they suggest reasons why MMR immunisation coverage is poor. There is a clear need to instigate educational campaigns at both the national and local levels that not only emphasise the safety of MMR vaccine and the danger of the vaccine-preventable diseases, but which also emphasise the efficacy of the vaccine and delineate the rationale behind the two-dose schedule.

Finally, since a majority of mothers value their GP's opinion most in making a decision to immunise and want more information from health professionals, the GP's role in education would appear to be central. Not only could this help to raise the uptake of the vaccine but it could also help to reassure those mothers who will have their child vaccinated the first time but are unhappy with the decision. Three of the four practices that declined to take part in the study gave as their reason that they did not want the subject raised with the mothers in their practice, fearing that this would put them off having the vaccination. It seems from our results that more information from responsible health professionals would have the opposite effect and help to counter the negative impact of media scare stories.

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