

SHORT PAPER

Vaccinations at home: a new strategy to contain vaccine hesitancy? The experience of ASL Napoli 1 Centro, Italy

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Abstract

Vaccination coverage are generally geographically variable, even within large cities; furthermore, across target population are embedded difficult-to-reach clusters. To address this issue and improve coverage of mandatory vaccinations, a study group explored bringing vaccination at home as an interventional strategy.

In a pilot experience, parents of unvaccinated and under vaccinated children of the 2020 birth cohort living in Naples, Italy were contacted by telephone to offer home administration of vaccinations. A specifically trained team arranged vaccinations visits at home. Coverage rates were evaluated at baseline and one month after the intervention strategy. A significant positive increase in hexavalent vaccine (+1.43%) and measles-mumps-rubella (+1.85%) coverage was registered despite the short duration of the pilot program. Home vaccination turned out to be a medical resource consuming but feasible and successful strategy to increase mandatory vaccinations coverage among the most difficult-to-reach and fragile segments of the pediatric population.

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Abbreviations: VC: vaccination coverage; LHU: Local Health Unit; AEFIs: adverse events following immunization.

Introduction

Vaccinations is recognized as one of the most effective and harmless approaches for the prevention of many even lethal infectious diseases (1). Despite this finding, in recent years there has been a decline in vaccination coverage (VC), which has led to the development of outbreaks of vaccine-preventable diseases (2).

Many factors can contribute to low immunization coverage, such as the lack of access to immunization services, missed opportunities for vaccination during healthcare visits alone with other determinants of vaccination hesitancy (3, 4).

Vaccine hesitancy refers to a delay in acceptance or the refusal of vaccination despite availability of vaccination services (5).

The reasons for this reluctance towards vaccinations are complex, varying across time and depend on multiple variables such as geographic barriers (6), perceived risk of adverse events following immunization and unfounded fear of serious vaccine-induced diseases including autism (7), but also the low perception of the risk/severity of the alternative, the natural disease (1).

Furthermore, low socio-cultural conditions and social risk negatively impact empowerment and generate the belief that the vaccination is not a priority (8).

In response to the progressive decline in VC, in Italy further to the National Plan for Vaccine Prevention (9) ten vaccinations: poliomyelitis, diphtheria, tetanus, hepatitis B, *Haemophilus influenzae* type b, acellular pertussis (hexavalent vaccine) and measles, mumps, rubella and chicken pox (MMRV vaccine) were declared mandatory for children aged 0 to 16 years (10). According to the law, the aforementioned mandatory vaccinations are required for admission to childcare up to primary school. Only children with health problems for which vaccinations are not indicated and those who have got immunization as a result of natural illness, such as varicella, can be declared exempt from the mandatory vaccinations (9, 11, 12).

Traditionally, in Italy, a relevant variability across Regions of vaccination coverage is observed; in the 2020 birth cohort a range of 86.28% - 96.42% for the hexavalent vaccine coverage and 89.20% and 96.05% for MMR vaccine coverage was reported for toddlers, being the national target of 95% (http://www.salute.gov.it/imgs/C_17_tavole_20_10_0_file.pdf¹). At regional or local figures can be even lower.

In the area of the Local Health Unit (LHU) ASL Napoli 1 Centro, vaccination coverage for hexavalent and MMR vaccines are traditionally below 90%, due to the complexity and heterogeneity of community profiles.

Furthermore, the COVID-19 pandemic increased vaccine hesitancy (13, 14) for routine pediatric vaccinations throughout Italy (15).

To address this issue, in the LHU ASL Napoli 1 Centro, a home vaccination pilot program was implemented as an alternative strategy to improve coverage of mandatory vaccinations foreseen in toddlers.

Context

The Campania Health Information System (SINFONIA) was searched to find unvaccinated and under vaccinated toddlers belonging to the 2020 birth cohort by using poliomyelitis (as a proxy of the hexavalent vaccine) and measles (as a proxy of MMR vaccine) search terms. Parents of the selected subjects were contacted by telephone and informed on the possibility of receiving mandatory vaccines at home.

A devoted Project Team, composed by a physician and a nurse with previous experience in vaccination and proficient in pre-vaccinal screening interview including vaccination history, allergies, the history of adverse events following immunization (AEFIs) and specifically trained on vaccine storage and preservation techniques and equipped for the management of serious and potential life-threatening events in a no healthcare context (16).

A medical car belonging to the LHU was used by the Team to reach each vaccine destination. Upon arrival at home, project team performed a vaccination anamnesis, specifically checking for eventual contraindications and precautions. The parent informed consent was then obtained for each child to be vaccinated. Project Team monitored each toddler for 30 minutes after the administration of the vaccine. Afterwards, parents were contacted by phone by the Project Team within 10 to 14 days after the vaccination to check the insurgence of any AEFIs and to orally express their degree of perceived satisfaction on the experience of home vaccination. Administered vaccinations were recorded into the regional database.

The primary end point of the pilot program was to increase the vaccination coverage for the mandatory

¹ http://www.salute.gov.it/imgs/C_17_tavole_20_10_0_file.pdf

vaccinations by hexavalent and MMR vaccines within 24 months of age, in the cohort of children been born in 2020, evaluated at the start and end (December 31, 2022, vs January 31 2023), of the observation period (one month). Coverage values were expressed as the number of vaccinated children (numerator) divided by the whole eligible pediatric population (denominator) of the 2020 birth cohort registered in the LHU Napoli 1 Centro.

The chi-square test was executed on proportions using the SPSS statistical program, version 12.0 for Windows (IBM, Armonk, NY, USA). Analysis findings were considered statistically significant at two-tailed p -value ≤ 0.05 .

Results

A total of 142 toddlers eligible from the database query were vaccinated within the Pilot Project time frame.

We evaluated two-time points coverage rates for mandatory vaccinations: at baseline (31 December 2022) and after one month of the intervention strategy (31 January 2023) (Table 1).

We reported the number of vaccinated children (numerator) and the eligible pediatric population (denominator) registered in the Naples 1 Center Local Health Authority, ASL Napoli 1 Centro, of the 2020 birth cohort.

On 31 January 2023, 24-month coverage rates were 91.77% for poliomyelitis and 92.38% for measles corresponding to an increase of +2.62% and +3.75% respectively, as compared to the immunization rate of the previous month.

After the home vaccination implementation, the increase in poliomyelitis and measles vaccines coverage were +1.43% and +1.85% respectively (p -value < 0.05) (Table 1).

Many families (85 out of 142) preferred the coadministration of vaccines for their children. At the follow-up, 15 AEFIs were reported in 10 toddlers after MMR vaccines: of these, 10 reported fever and discomfort while 5 reported losses of appetite. All AEFIs were classified as mild in severity and managed by the toddler family pediatricians.

During the follow-up phone call, all participants (142/142, 100%) expressed a strong preference for home vaccine administration as compared to the traditional one. The reasons for this preference were mainly: the abolition of logistical access difficulties as distance, absence of their own means of locomotion, difficulty in accompaniment by partners absent for work reasons or detention measures, mothers themselves under house arrest, single-parent families, homes located on the upper floors of old buildings without a lift and presence of other young children that cannot be left disattended. In addition, most of the families (130 families, 91.5 %) belonged to deprived socio-economic and cultural contexts, and vaccination was not considered a priority (Table 2).

During the vaccination activities carried out at home, it was also possible to extend the offer for mandatory or recommended vaccinations to 13 brothers/sisters of the vaccinees, as their immunization profiles were incomplete.

The Pilot Project encompassed 20 working days where the Project Team personnel was dedicated full time to the project. A mean of 7.2 eligible subjects were vaccinated per day. In principle, for each eligible vaccinees, a mean of 10 minutes for visit preparation (including cold chain arrangements) and by phone post vaccination AEFIs monitoring, 20 minutes to obtain consent, vaccine administration and registration, 30 minutes for potential AEFIs waiting time, summing up to 1 hours per vaccinees could be postulated. Residual daily working time was devoted to car transfer from and back to LHU.

Table 1 - Vaccine coverage (VC) rate (%) registered for mandatory vaccinations at 24 months, stratified by vaccine type and month of administration, along with the percentage differences between the 31 January 2023 and 31 December 2022 rates in the Naples 1 center local health authority.

Vaccine	31 December 2022 VC rate (%)	31 January 2023 VC rate (%) with home immunizations alone	% difference	<i>p</i> -value	31 January 2023 Total VC rate (%)	% difference
Polio	89.15	90.58	+1.43	≤ 0.05	91.77	+2.62
Measles	88.63	90.48	+1.85	≤ 0.05	92.38	+3.75

Table 2 - Demographic characteristics, logistical access difficulties, socio-economic/cultural contexts for vaccinees families

Characteristics	Number
Vaccinated children	142
Third hexavalent + first trivalent vaccinations	85
Third hexavalent	14
First trivalent vaccination	43
Family size	
1 child	1
2 children	21
3 children	65
4 or more children	55
Difficulty in vaccination services access	
distance	51
absence of their own means of locomotion	35
absence of partners for work reasons	88
absence of partners for detention measures	23
mother under house arrest	12
single-parent families	26
homes located on the upper floors of old buildings without a lift	79
Socio-economic and cultural conditions of families	
Severely deprived/conditions of social and health risk	130

Discussion and Conclusions

The home vaccination Pilot Project reported here was implemented as an alternative strategy to improve mandatory vaccinations coverage in toddlers in a LHU in Italy.

A smooth but significant positive increase in poliomyelitis and measles vaccines coverage was measured with home immunizations despite the short duration of the Pilot Project implementation (one month). Interestingly, coverage rates for mandatory vaccinations were higher not only than in previous years but also in the Covid-19 pre-pandemic era.

During the COVID-19 pandemic we have witnessed, in Campania as in Italy, a drop in immunization coverage, mainly due to the fear of contagion but also, in some areas of the country, to the reduction in supply.

Alternative settings, such as home vaccination, were reported to be useful mainly for reaching children belonging to the most deprived and most fragile sections of the population and, therefore, at greater risk of contracting vaccine-preventable diseases (17). In the present Pilot Project, 100% of

respondents firmly preferred home vaccination for convenience. Vaccination convenience refers to the influence of certain factors on the decision to get vaccinated such as physical availability, geographical accessibility, and quality immunization services and it is identified by the WHO Strategic Advisory Group of Experts (SAGE) as one of the key drivers of vaccine hesitancy (5).

The vaccination practice at home reduced the child's discomfort; the absence of waiting time and healthcare setting, the family environment and the presence of both parents or relatives proved to be reassuring. This intervention has also allowed the demedicalization of the vaccination act: the home setting, bringing the vaccination act back to a normal routine practice and therefore has reduced the parents' concern.

Home vaccination also proved to be an opportunity to educate, during the post-vaccination observation period, parents about the child's life habits, diet, the importance of reading aloud and interventions aimed at promoting responsive parenting.

In principle, home vaccination turned out to be expensive in the LHU public health perspective. It required full time engagement of healthcare workers highly trained in vaccine administration and routine procedures storage and transport of vaccines, the availability of emergency equipment on site. Roughly, time needed to vaccinate one toddler at home was 5 time higher (60 minutes vs 12 minutes) with respect to a routine single visit at LHU office. As a consequence, to be economically affordable home vaccination should be better framed in specific contexts and be limited to particular situations.

The experience reported here is affected by many methodological limitations. Due to restricted personnel availability out of the routine activity, it was possible to keep the project ongoing only for one month; consequently, Pilot Program sample size is too limited to conduct more detailed or statistical analysis. Furthermore, due to the preventive nature of the healthcare intervention, it is not possible to fully estimate the achieved benefit in terms of public health (further to the single subject protection), the direct and indirect medical costs and consequent cost/effectiveness of the Pilot Program. A longer period and a larger cohort of children are needed to establish the actual effectiveness and sustainability of the intervention.

Certainly, home vaccination represented a concrete example of a Public Health intervention inspired by the principles of equity and universality of assistance,

sensitive to the protection of the weakest groups and deprived segments of the population. This strategy may favor adherence to vaccination practice in disadvantaged and poor areas and in conditions in which access to healthcare offices is compounded by socio-cultural deprivation protecting children from transmissible and sometime life-threatening infectious diseases.

Contributorship: MT contributed to the conception/design of the study; CU drafted and revised the manuscript; LG, AV and IL collected the data, MC and MP analyzed and interpreted the data; CV approved the final version to be submitted. All authors contributed to multiple reviews and feedback on the manuscript and gave final approval before submission.

MT and CU contributed equally to this work and share first authorship.

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Riassunto

Vaccinazioni a domicilio: una nuova strategia per contenere l'esitazione vaccinale? L'esperienza dell'ASL Napoli I Centro, Italia

Le coperture vaccinali sono generalmente variabili geograficamente, anche all'interno delle grandi città; inoltre, all'interno della popolazione target ci sono cluster difficili da raggiungere. Per contenere questo problema e migliorare la copertura delle vaccinazioni obbligatorie, un gruppo di studio ha utilizzato la vaccinazione a domicilio come strategia di intervento.

In un'esperienza pilota, i genitori di bambini completamente o parzialmente non vaccinati della coorte di nascita del 2020 che vivono a Napoli, in Italia, sono stati contattati telefonicamente per offrire loro la somministrazione a domicilio delle vaccinazioni. Un'équipe appositamente formata ha organizzato le sedute vaccinali a domicilio. I tassi di copertura sono stati valutati all'inizio e dopo un mese di strategia d'intervento.

Nonostante la breve durata del programma pilota, è stato registrato un significativo aumento della copertura del vaccino esavalente (+1,43%) e di morbillo-parotite-rosolia (+1,85%). La vaccinazione a domicilio si è rivelata una strategia che richiede risorse mediche, ma fattibile e di successo, per aumentare la copertura vaccinale obbligatoria tra i segmenti più fragili e difficili da raggiungere della popolazione pediatrica.

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