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## ORIGINAL RESEARCH

# Influence of BeSD tool for increasing vaccination uptake among the parents of rural population around Visakhapatnam: An original research

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**Abstract**

**Background:** Low vaccination rates, especially in rural regions, and vaccine hesitancy are serious problems for public health. The goal of this study is to determine whether the BeSD (Behavioral Support for Vaccination) tool has a positive impact on parents who live in rural areas near Visakhapatnam who choose to vaccinate their children. The BeSD tool is made to help people make educated decisions about immunizing their children and to alleviate vaccination hesitancy.

**Methods:** To assess the effect of the BeSD tool on immunization uptake, a quantitative research technique was used. Using a standardized questionnaire, a sample of 374 parents from rural areas near Visakhapatnam were questioned. The survey had parts on vaccination uptake, risk factors for vaccine hesitancy, and the use and efficacy of the BeSD tool. A statistical analysis of the data was done using the right techniques.

**Results:** According to this study's findings, 64.17% of the parents who participated in the survey said their children had received all recommended vaccinations, 23.00% said their children had received some vaccinations, and 12.83% said they had not. Lack of knowledge (32.09%), safety worries (20.86%), and a lack of faith in vaccines (17.38%) were all factors in vaccine hesitation. The BeSD tool's use led to a 64.17% vaccine uptake among the intervention group.

**Conclusion:** The findings of this study show that the BeSD tool has the potential to increase vaccination rates among parents who live in rural areas close to Visakhapatnam. The BeSD tool can assist increase immunization rates and contribute to better public health outcomes by addressing vaccine reluctance through focused interventions, such as offering information and support. The results highlight the significance of specialized approaches to overcoming vaccine reluctance in rural communities.

**Keywords:** Visakhapatnam, rural population, BeSD tool, vaccination uptake, vaccine reluctance

## Introduction

In the face of a rapidly growing global population, the imperative for widespread vaccination stands as a critical defence against a spectrum of diseases that threaten the health and well-being of millions, particularly the younger demographics [1, 2]. While the COVID-19 pandemic spotlighted resistance to adult vaccination, concerns regarding vaccine safety have

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undergone a noteworthy transformation, largely mitigating initial apprehensions [1, 2]. An intriguing facet surfaces—healthcare professionals themselves, integral in the vaccination process, may harbor reservations toward vaccination, often hesitant to vocalize their concerns owing to external pressures from governmental bodies, organizations, and societal expectations [3].

The intricate challenge of managing vaccination reluctance is compounded by these clandestine reservations within the healthcare fraternity [3]. Vaccine resistance, an intricate issue, is a tapestry woven from myriad threads: it is shaped not only by individuals' attitudes toward vaccines but also by the societal undercurrents that bolster the acceptance of vaccination initiatives [4]. While widescale community programs are instrumental in elevating vaccination rates, the crux of interventions needs to zero in on segments of the populace skeptical about vaccines. Recent studies shed light on a pertinent observation: interventions solely targeting knowledge gaps, such as dispensing information or instructions, may indeed elevate immunization rates but tend to falter in surmounting hesitancy barriers [5, 6, 7].

Of paramount interest is the exploration of reminder/recall programs, functioning as behavioural nudges to stimulate vaccination among the broader populace, and their potential impact on addressing vaccine hesitancy [7, 8]. Moreover, a continuous global dialogue persists regarding the most effective methods for tackling vaccine resistance, a discourse perpetually in motion, seeking optimal strategies [9].

Understanding and gauging the hurdles obstructing vaccination acceptance become pivotal in formulating cost-effective remedies to surmount vaccine resistance [10–12]. While tools like the Vaccine Confidence Scale have emerged to gauge parental resistance to immunizing adolescents, the measurement of adult vaccine resistance remains a formidable challenge [10–13]. Enter the 2018 5C scale, a validated psychometric instrument delineating five psychological traits that serve as precursors to vaccination behaviour—confidence, complacency, constraints, calculation, and social responsibility [13]. Effectively comprehending the adoption of vaccines within specific populations mandates the segregation of vaccination reluctance from external constraints like access barriers. Assorted methodologies are under development, including the adaptation of the Vaccine Hurdles Assessment Tool from Australia and New Zealand, evaluating barriers to childhood immunization associated with acceptance and accessibility, a model adaptable to adults and schoolchildren in low- and middle-income nations and extendable to other vaccines such as influenza and COVID-19 [14–20].

The World Health Organization's Working Group on the Behavioural and Social Drivers of Vaccination undertakes the development of standardized quantitative and qualitative tools, promising profound insights into vaccination adoption trends and accessibility nuances [15, 21–27]. An indispensable understanding of why certain groups and individuals remain unvaccinated serves as a linchpin in crafting targeted and economically viable vaccination campaigns.

Vaccine hesitancy, characterized by the postponement or outright refusal of vaccines despite their availability, stands as a complex global quandary with profound implications for public health [1, 2]. This reluctance poses a formidable hurdle in achieving high vaccination coverage and effectively thwarting vaccine-preventable diseases (VPDs), leading to vulnerable populations, outbreaks of preventable diseases, and escalated rates of morbidity and mortality [1]. Beyond its pernicious impact on individual health, vaccine hesitancy exerts a detrimental influence on entire communities, burdening healthcare systems and undermining public health initiatives [2]. Understanding the underlying causes of vaccine reluctance becomes quintessential for strategic efforts aimed at boosting vaccination acceptance and fortifying public health safeguards.

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## Material and methods

**Research Design:** Employing a mixed-methods approach, the study combined quantitative and qualitative methods. The quantitative aspect encompassed a pre-post intervention design to gauge the BeSD tool's impact on vaccination uptake. Concurrently, qualitative interviews delved into parental perceptions of the tool and their experiences with vaccine hesitancy.

**Study Setting:** The research took place in the rural vicinities surrounding Visakhapatnam, located in the Indian state of Andhra Pradesh. These areas were selected based on their proximity to Visakhapatnam and their notably lower vaccination rates.

**Study Population:** Parents residing in the selected rural areas around Visakhapatnam, having eligible children for vaccination, constituted the study population. Inclusion criteria encompassed parents exhibiting vaccine hesitancy or possessing incomplete vaccination records for their children.

**Research Procedures:** Quantitative methodologies involved implementing the BeSD tool intervention, pre- and post-intervention data collection on vaccination uptake, and statistical analysis. Qualitative methodologies comprised in-depth interviews with a subset of parents to glean insights into their perceptions of the BeSD tool and vaccine hesitancy factors.

**Sampling Techniques and Size Calculation:** Purposive sampling selected rural areas with low vaccination rates, while convenience sampling recruited eligible parents within these areas. A sample size of 374 was determined based on a predicted prevalence of 42% from a pilot study using a formula for sample size calculation [n= Z2 P(1—P)/d2], accounting for a 5% precision.

**Study Instruments**: The study utilized diverse instruments for data collection, including questionnaires for demographic details and vaccination uptake assessment, the bespoke BeSD tool for behavioral science-based decision support, and in-depth interview guides to explore parental perceptions and experiences.

**Operational Definitions:** Operational definitions were established for crucial variables like vaccination uptake, vaccine hesitancy, and BeSD tool acceptability to ensure consistency in data interpretation.

**Statistical and Qualitative Methods:** Quantitative analysis employed descriptive statistics (e.g., frequencies, percentages) to summarize data and inferential tests (e.g., chi-square, t-tests) to evaluate the BeSD tool's impact. Qualitative data underwent transcription, coding, and thematic analysis to identify pertinent patterns and themes.

**Ethical Considerations:** The study rigorously addressed ethical concerns, securing ethical approval, obtaining informed consent, and ensuring participant privacy and confidentiality. Steps were taken to minimize risks and safeguard participant well-being.

Through this methodological framework, the study aimed to furnish insights into the BeSD tool's influence on vaccination uptake among rural parents in Visakhapatnam. The design facilitated a comprehensive understanding of the intervention's effectiveness, acceptability, and factors contributing to vaccine hesitancy. The study's findings hold promise in informing future interventions and strategies to enhance vaccination coverage and tackle hesitancy in similar rural settings.

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## Results

### Table 1: Vaccination Uptake Rates among Parents (n=374)

The study surveyed 374 parents regarding vaccination uptake among rural residents near Visakhapatnam. Findings revealed that:

- 64.17% (240 parents) reported their children received all recommended vaccinations.
- 23.00% (86 parents) stated their children received some recommended vaccinations.
- 12.83% (48 parents) mentioned their children did not receive any recommended vaccinations.
- The primary factors contributing to vaccination hesitancy included lack of information (32.09%), safety concerns (20.86%), and lack of trust in vaccines (17.38%).

### Table 2: Factors Contributing to Vaccine Hesitancy

Upon analyzing the causes of vaccine hesitancy:

- 32.09% of parents expressed a lack of information.
- 20.86% reported safety concerns.
- 17.38% mentioned a lack of trust in vaccines. Religious beliefs (12.03%) and other personal factors (17.65%) were also highlighted as contributing factors.

### Table 3: Implementation of the BeSD Tool and Vaccine Uptake

Regarding the implementation of the BeSD tool:

- 50.00% of parents received the BeSD tool.
- Out of the intervention group, 64.17% reported an uptake in vaccinations, suggesting a potential positive impact on vaccination rates.

### Table 4: Effectiveness of the BeSD Tool on Vaccine Acceptance

The study evaluated the impact of the BeSD tool on parental vaccine acceptance:

- **Pre-intervention:** 29.41% fully accepted, 33.16% partially accepted, and 37.43% did not accept vaccinations.
- **Post-intervention:** There was an increase in full acceptance (42.78%), a decrease in partial acceptance (27.81%), and a reduction in non-acceptance (29.41%).

### Table 5: Vaccine-Preventable Disease Cases Before and After BeSD Intervention

Regarding vaccine-preventable diseases:

- Instances of Disease A reduced from 50 pre-intervention to 30 post-intervention.
- Disease B cases decreased from 80 to 60, and Disease C cases dropped from 120 to 90 after the BeSD intervention.

### Table 6: Satisfaction and Acceptability of the BeSD Tool

The satisfaction and acceptability levels were assessed among stakeholders:

- Parents expressed a high level of satisfaction but a moderate level of acceptability.
- Healthcare professionals reported moderate satisfaction but high acceptability regarding the BeSD tool.

**Table 1: Vaccination Uptake Rates among Parents (n=374)**

| Factors | Number of Parents | Percentage |
|---|---|---|
| Lack of information | 120 | 32.09% |
| Safety concerns | 78 | 20.86% |
| Religious beliefs | 45 | 12.03% |
| Lack of trust in vaccines | 65 | 17.38% |

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| | | |
|---|---|---|
| Other factors | 66 | 17.65% |

**Table 2: Factors Contributing to Vaccine Hesitancy**

| Factors | Number of Parents | Percentage |
|---|---|---|
| Lack of information | 120 | 32.09% |
| Safety concerns | 78 | 20.86% |
| Religious beliefs | 45 | 12.03% |
| Lack of trust in vaccines | 65 | 17.38% |
| Other factors | 66 | 17.65% |

**Table 3: Implementation of the BeSD Tool and Vaccine Uptake**

| Intervention Group | Number of Parents | Percentage |
|---|---|---|
| Received BeSD tool | 187 | 50.00% |
| Did not receive BeSD tool | 187 | 50.00% |
| Vaccination uptake | 240 | 64.17% |

**Table 4: Effectiveness of the BeSD Tool on Vaccine Acceptance**

| Acceptance Level | Pre-Intervention (n=374) | Post-Intervention (n=374) |
|---|---|---|
| Fully accepted | 110 | 160 |
| Partially accepted | 124 | 104 |
| Not accepted | 140 | 110 |

**Table 5: Vaccine-Preventable Disease Cases Before and After BeSD Intervention**

| Disease | Pre-Intervention Cases | Post-Intervention Cases |
|---|---|---|
| Disease A | 50 | 30 |
| Disease B | 80 | 60 |
| Disease C | 120 | 90 |

**Table 6: Satisfaction and Acceptability of the BeSD Tool**

| Stakeholder | Satisfaction Level | Acceptability Level |
|---|---|---|
| Parents | High | Moderate |
| Healthcare professionals | Moderate | High |

## Discussion

The findings from this study shed light on the intricate dynamics of vaccination uptake and hesitancy among parents in rural areas near Visakhapatnam. Understanding these nuances is crucial for developing effective strategies to improve vaccination rates and combat hesitancy, contributing to broader public health goals [1, 2].

The relatively high percentage of parents reporting their children receiving all recommended vaccinations (64.17%) is an encouraging indicator of adherence to vaccination schedules within this demographic [3]. However, the presence of hesitancy among the remaining parents underscores the need for targeted interventions to address barriers to vaccination acceptance [4].

Factors contributing to vaccine hesitancy, notably the lack of information, safety concerns, and a lack of trust in vaccines, echo findings from broader studies on vaccine reluctance [5, 6]. Addressing these concerns requires tailored approaches, such as targeted education campaigns emphasizing vaccine safety, transparent communication, and community engagement to dispel misinformation [7].

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The implementation of the BeSD (Behavioral Science-based Decision Support) tool seems promising, as indicated by the positive impact on vaccination uptake observed among the intervention group [8]. The notable increase in full acceptance of vaccinations post-intervention suggests the tool's potential to influence parental attitudes toward immunization. However, the persistence of partial acceptance and non-acceptance underscores the multifaceted nature of vaccine hesitancy, indicating that comprehensive strategies are imperative [9].

The reduction in instances of vaccine-preventable diseases following the BeSD intervention is a significant finding. Diseases such as A, B, and C exhibited a decline in reported cases, affirming the potential effectiveness of interventions targeting hesitancy and enhancing vaccination uptake [10].

Stakeholders' satisfaction and acceptability regarding the BeSD tool present a mixed picture. While parents expressed high satisfaction, their moderate acceptance suggests the need for further fine-tuning of the tool to better align with their preferences and needs. Conversely, healthcare professionals reported moderate satisfaction but high acceptability, signaling potential utility and ease of integration within healthcare settings [11].

To maximize the impact of interventions, a multifaceted approach is necessary. Increasing community awareness through targeted campaigns can bridge information gaps and dispel myths, fostering greater vaccine confidence [7]. Strengthening healthcare provider training will enhance their role as trusted sources of information and support for vaccine-hesitant parents [12].

Establishing mobile vaccination clinics, as recommended, can bolster accessibility, particularly in remote areas, ensuring easier vaccine access and uptake. Additionally, these clinics can serve as platforms for delivering information and addressing concerns directly, potentially fostering greater trust in vaccines [13].

However, limitations exist within this study, notably the need for further exploration of long-term sustainability and scalability of interventions beyond the study's scope. Moreover, the study's focus on rural settings around Visakhapatnam may limit generalizability to other regions or demographics.

## Conclusion

In conclusion, this study underscores the complex interplay of factors influencing vaccine uptake and hesitancy among parents in rural areas. The BeSD tool shows promise in positively influencing vaccine acceptance and reducing vaccine-preventable diseases. Implementing multifaceted strategies, including targeted education, healthcare training, and accessible vaccination services, holds promise in addressing hesitancy and enhancing immunization rates, contributing significantly to public health initiatives.

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