Internship Training

at

THE INCLENT TRUST INTERNATIONAL, NEW DELHI, INDIA

Nasal carriage of streptococcus pneumonia among the community children and PCV Impact research

by

VANDANA GAUTAM

PG/017/72

Under the guidance of

Ms. Divya Aggarwal
Assistant Professor and Assistant Dean- Academics

Post Graduate Diploma in Hospital and Health Management

2017-19

International Institute of Health Management Research New Delhi

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A Report

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VANDANA GAUTAM

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THE INCLEN TRUST INTERNATIONAL

RESEARCH AND TRAINING FOR IMPROVING
EQUITY, EFFICIENCY AND QUALITY IN HEALTH CARE

(COMPLETION OF DISSERTATION FROM THE INCLEN TRUST INTERNATIONAL, NEW DELHI)

The certificate is awarded to

Vandana Gautam

in recognition of having successfully completed her
Internship in the INSPIRE Project
(INDIAN NETWORK FOR STREPTOCOCCUSPNEUMONIAE AND PCV IMPACT RESEARCH)

and has successfully completed her Project on

"Nasal carriage of streptococcus pneumonia among the community children and PCV Impact research"

Date: 3rd June, 2019

Organisation: The INCLEN Trust International

She comes across as a committed, sincere & diligent person who has a strong drive & zeal for learning.

We wish him/her all the best for future endeavors.

Training & Development

Zonal Head-Human Resources

TO WHOMSOEVER IT MAY CONCERN

This is to certify that Ms. Vandana Gautam student of Post Graduate Diploma in Hospital and Health Management (PGDHM) fromInternational Institute of Health Management Research, New Delhi has undergone internship training at INCLEN IEO from February 2019 to April 2019.

The Candidate has successfully carried out the study designated to her during internship training and her approach to the study has been sincere, scientific and analytical.

The Internship is in fulfillment of the course requirements.

I wish her all success in future endeavors.

PK Panda

Dr Pradeep K Panda
Dean, Academics and Student Affairs

IIHMR, New Delhi

Divya Aggarwal

Divya Aggarwal
Assistant Professor &Assistant Dean (Academics and Student Affairs)
IIHMR, New Delhi

Certificate of Approval

The following dissertation titled **"Nasal carriage of streptococcus pneumonia among the community children and PCV Impact research"** at **"The INCLEN Trust International, New Delhi"**is hereby approved as a certified study in management carried out andpresented in a manner satisfactorily to warrant its acceptance as a prerequisite for the award of **Post GraduateDiploma in Health and Hospital Management** for which it has been submitted.It is understood that by this approval the undersigned do not necessarily endorse or approve any statement made, opinion expressed or conclusion drawn therein but approve the dissertation only for the purpose it is submitted.

Dissertation Examination Committee for evaluation of dissertation.

Name	Signature
Dr Preetha GS	

Certificate from Dissertation Advisory Committee

This is to certify that **Ms. Vandana Gautam,** a graduate student of the **Post- GraduateDiploma inHealth and Hospital Management**has worked under our guidance and supervision.She is submitting this dissertation titled **"Nasal carriage of streptococcus pneumonia among the community children and PCV Impact research"**at **"THE INCLEN TRUST INTERNATIONAL, NEW DELHI"** in partial fulfillment of the requirements for the award of the Post- GraduateDiploma in Health and Hospital Management.

This dissertation has the requisite standard and to the best of our knowledge no part of it has been reproduced from any other dissertation, monograph, report or book.

Divya Aggarwal,
Assistant Professor &Assistant
Dean (Academics and Student Affairs),
IIHMR Delhi

Dr. Abhishek Aggarwal,
Project Officer,

THE INCLEN TRUST
INTERNATIONAL, NEW
DELHI

INTERNATIONAL INSTITUTE OF HEALTH MANAGEMENT RESEARCH, NEW DELHI

CERTIFICATE BY SCHOLAR

This is to certify that the dissertation titled is **"Nasal carriage of streptococcus pneumonia among the community children and PCV Impact research"**submitted by Vandana Gautam Enrollment No.PG/17/072under the supervision of Divya Aggarwal for award of Postgraduate Diploma in Hospital and Health Management of the Institute carried out during the period from 2017 to 2019embodies my original work and has not formed the basis for the award of anydegree, diploma associate ship, fellowship, titles in this or any other Institute or other similar institution of higher learning.

Vandana

Signature

THE INCLEN TRUST INTERNATIONAL
RESEARCH AND TRAINING FOR IMPROVING
EQUITY, EFFICIENCY AND QUALITY IN HEALTH CARE

FEEDBACK FORM

Name of the Student: Ms. Vandana Gautam

Dissertation Organisation: IIHMR, Delhi

Area of Dissertation: Child Health

Attendance: 100%

Objectives achieved: Helped in data collection of Pre PCV era in a community site.

Deliverables: - Collecting information from Community
- Working with team for data collection and storage and transport of NP swabs.

Strengths: - Hard working, Sincere.

Suggestions for Improvement:
Communication skills.

Suggestions for Institute (course curriculum, industry interaction, placement, alumni):
- She can be hired as ARO

Abhishek

Signature of the Officer-in-Charge/ Organisation Mentor (Dissertation)

Date: 3/6/2019
Place: New Delhi.

Acknowledgement

My vision at the time of starting my dissertation is to explore about Public Health research and opportunities in this sector.

I am obliged to thank Prof Narendra Kumar Arora (Executive Director) for providing me this opportunity to carry out my study as dissertation and for his continuous support and motivation.

I wish to express my special gratitude toDr. Abhishek Aggarwal (Program Officer) for his guidance and support regarding study. His step by step instructions help me a lot in doing a faithful study. He has continuous source of new and innovation idea and a different kind of professionationlism and work style. I am thankful to him for his faith on me which boost my confidence level.

I thank my research office, Dr. AbhishekWahi.

My heartful thanks to Divya Aggarwal (university Guide) for always being path locator when I got stuck at some point. Without him I was not able to complete my dissertation.

I am also thankful to all my colleagues at INCLEN Trust International, New Delhi for their support and coordination in completion of my study. Collective action by all provides me this opportunity to complete to complete my dissertation.

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Part-1

Profile of the Organization

PROFILE OF THE ORGANIZATION

THE INCLEN TRUST INTERNATIONAL

The INCLEN Trust International is a 'not for profit' research organization conducting collaborative, multi-disciplinary studies on high priority global health issues. Clinical Epidemiology Units and Clinical Epidemiology Research Training Centre located in 89 academic institutions in 34 countries are core functional units of INCLEN. Globally, INCLEN network is grouped in to seven regional networks.

In 1980, INCLEN was started as a project of Rockefeller Foundation with an overarching goal to promote Clinical Epidemiology as a bridge discipline between Clinical Medicine and Public Health. In 1988, INCLEN Inc. was established as an independent, not for profit organization in Philadelphia, USA. In 2000, the leadership shifted to Low- and Middle-Income Countries and The INCLEN Trust International was established. Global headquarters was shifted to Manila, Philippines. In 2005, global headquarters were shifted to New Delhi, India.

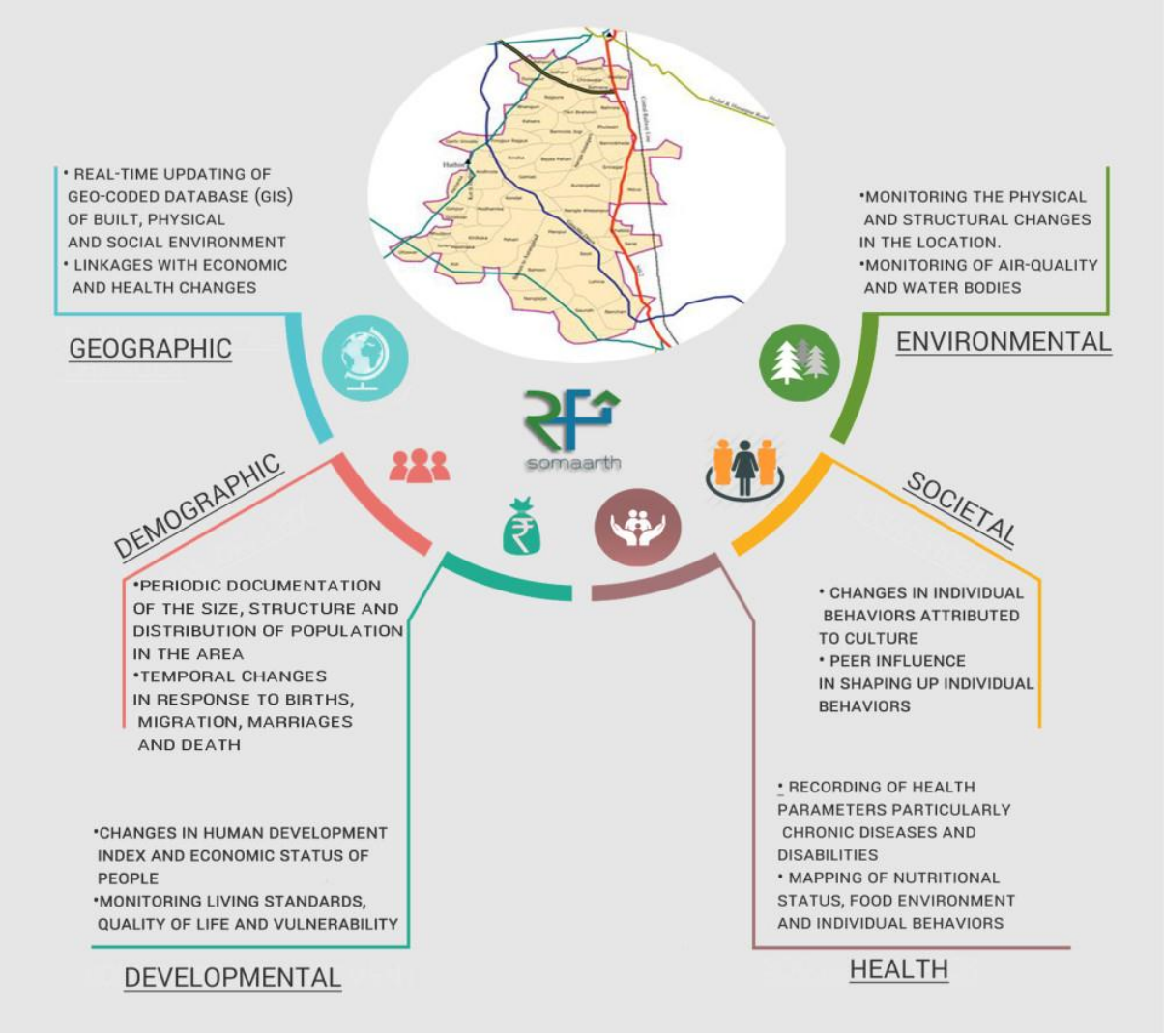
Presently INCLEN Executive Office (IEO) is located in New Delhi and collaborates with over 218 institutes in India that include medical schools, research institutes and non-governmental organizations. INCLEN Executive Office (IEO) maintains a strong and strategic relationship with various central and state government departments like Ministry of Health and Family Welfare (MOHFW) and Indian Council of Medical Research (ICMR) and several professional bodies. INCLEN is recognized as a Scientific and Industrial Research Organization (SIRO) and has acquired tax exemptions and FCRA approvals to receive foreign funds.


INTERNATIONAL CLINICAL EPIDEMIOLOGY NETWORK
RESEARCH
COLLABORATIONS
CAPACITY BUILDING
THE INCLEN TRUST INTERNATIONAL
RESEARCH
CAPACITY BUILDING
COLLABORATIONS
Global Health
• Intervention Studies
• Implementation Science
• Environmental Studies
• Surveillance
Building Research Leaders
• Leadership & Management Program
• PhD Programs
• Internships
• Workshops
Network Studies
• Multi Centric
• Multi Country
• Multi Sectoral


GLOBAL NETWORK
INDIAN NETWORK
34 COUNTRIES
7 REGIONAL CLENS
89 CEU's & CERTC's
184 MEDICAL COLLEGES
22 RESEARCH INSTITUTIONS
CanUSACLEN
CHINACLEN
INCLEN Africa
INCLEN Asia
INDIACLEN
LatinCLEN

In 2009, IEO has established a Demographic, Development and Environmental Surveillance Site (DDESS) – SOMAARTH, in Palwal district, Haryana (60 KMs away from New Delhi). SOMAARTH covers 51 contiguous rural villages encompassing over 200,000 population. We have an MOU with Government of Haryana to work in Palwal district.

SOMAARTH work towards



Vision: "To attain equity in health for development through essential research and training in global health and related disciplines"

Mission: "We achieve this by using the network to conduct collaborative, interdisciplinary research on high-priority health problems, and to train future generation of leaders in healthcare research".

INCLEN is a unique global network of clinical epidemiologists, bio-statisticians, health social scientists, health economists and other professionals affiliated to key academic institutions

We provide a platform for working professionals to engage in research activities that shall improve the health of disadvantaged people in low and middle-income countries and promote evidence based equitable healthcare practices.

Part-2 : Dissertation

Nasal carriage of streptococcus pneumonia among the community children and PCV Impact research

Abstract

Background: Streptococcus pneumoniae is one of the most common bacterial causes of community-acquired pneumonia. Streptococcus pneumoniae is a major cause of pneumonia, meningitis, and other serious infection among children in India. India introduced the PCV-13 in several states in 2017 and is poised to successfully combat the burden of pneumonia in the country once scale up of vaccine introduction and sustained high coverage is achieved. India introduced the PCV-13 in 6 state in 2017-2019 (Himachal Pradesh, Uttar Pradesh, Bihar, Rajasthan, Madhya Pradesh, and Haryana) with plans to additional districts and states beyond 2019. This study aims to evaluate the prevalence and dynamics of pneumococcal nasopharyngeal colonization in healthy children aged 5-59 months.

Methods: A community based cross-sectional descriptive study among children aged 5-59 months was planned to be conducted in Somaarth DDESS Palwal, which is also a rural field practise area of the INCLEN TRUST INTERNATIONAL, New Delhi. It is spread over an area 251.7 sqkm covering 51 villages and three blocks (hathin, palwal and hodal), where a population of 2 lakh people resides. Sample size was detect 25% impact on VT carriage in vaccine – age-eligible 9 children aged 5-11 months swabbed at each site in each of the pre-and post -PCV periods for 2-tailed $p<0.05$ and 80% power. This corresponded to a change from 26% VT NP carriage post-PCV, which is the change expected if there is 50% PCV coverage in this age group. If coverage is higher (70%) in year1, no more carriage surveys are proposed. We have to explained the procedure to the parents for two nasopharyngeal swabs which have been obtained from the eligible children after informed consent. These samples have been maintained and transported in ice box to the lab within 4 hours of collection for culturing on site .The samples were properly transported to lab where they are kept under ±80°C in deep freezer with their labelling on it in cryovial box and then they are stored till the transportation of the CMC Vellore and the further processing the CMC.

Result: The prevalence of S. pneumoniae in the NP samples of the study participants was 70%. Among these S. pneumoniae positive study participants 55.7% were having PCV-13 vaccine serotypes, 41.4% were having non-vaccine serotypes and rest of 2.9% could not be serotyped.

Keywords: Streptococcus pneumonia, Nasopharyngeal carriage, community, healthy children.

Introduction

The disease Pneumonia is nothing but an acute respiratory infection caused in the lungs. It is most commonly caused by particular viruses or bacteria and are spread due to contact with infected people. To preventing pneumonia specially in children is essential to reduce mortality.(1)

The most common community-acquired pneumonia, is cause by Streptococcus pneumoniae, which causes both invasive (e.g. bacteraemia) and non-invasive (e.g. community-acquired respiratory tract) infections. (2), (3) it is unfortunate that Pneumococcal disease which can be prevented by vaccinated is reason of highest mortality among the diseases which can be prevented by vaccination according to the World Health Organization. (4)

Pneumococcus is the leading causes of severe pneumonia which is responsible for 105,000 deaths of children per year in India. The Global disease burden models for the year 2015, estimate that 20% of cases of children had occurred in India. The lunch of PCV into the Indian national immunization schedule started in 2017 is dedicated to successfully combat the burden of pneumonia in the country once scale up of vaccine introduction and sustained high coverage is achieved. The Government of India recommended robust evaluation of PCV impact to facilitate national rollout and sustained use of PCV. There are 90 serotype of streptococcus pneumoniae, out of which very few serotypes the causes of disease. The most wide spread serotype 10 and 13 are targeted by two pneumococcal conjugate vaccines (PCV). The amount of effect PCV have on nasopharyngeal carriage indicates the efficacy of that PCV vaccine.

Pneumococcal nasopharyngeal colonization has considered a necessary precursor for pneumococcal disease. The high prevalence and early acquisition of pneumococcal nasopharyngeal colonization in children in India is likely due to the high prevalence of risk factors for bacterial nasopharyngeal colonization, including household crowding, and socioeconomic status.

PCV has contributed to substantial reductions in pneumococcal disease in children in a variety of epidemiologic setting. The direct protection provided by PCV is largely mediated by the ability of the vaccine to reduce acquisition and density of vaccine type pneumococcal nasopharyngeal colonization. CAP is one of the major cause of mortality & morbidity and thus it exerts lot of financial burden on health sector.(5)

Still the Pneumonia causes approximately twenty Lacks deaths of children every year which translates to 20% of all child mortality accounts for pneumonia. It provides estimates of mortality impact of the case-management approach proposed by WHO. Therefore Community based interventions are of great importance . (6)

As reported by World Health Organization nearly 5 lakh children (less than 5 years) are infected by S. pneumoniae every year and mostly occur in developing countries.(7)

India introduced the PCV-13 in 6 state in 2017-2019 (Himachal Pradesh, Uttar Pradesh, Bihar, Rajasthan, Madhya Pradesh, and Haryana) with plans to additional districts and states beyond 2019.

Important Available facts have shown few risk factors leads to more prevalence of pneumonia. They are: Malnutrition, LBW, Lack of exclusive, Breast feeding for 6 months, no measles Immunization, living in overcrowding area.so to reduce prevalence of pneumonia and deaths due to it. The more emphasis needs to be given to aim the above-mentioned risk factors in the longer span of time. So any action, that reduces the deaths caused by pneumonia is very important from the perspective of public health. (8) Healthy children between the age group 5-59 months were taken for the study.

PCV‑13 contains of the polysaccharides found in the antigens present on the capsular of *S. pneumoniae* serotypes 1; 3; 4; 5; 6A; 6B; 7F; 9V; 14; 18C; 19A; 19F and 23F.

A study which was done in India has found PCV-13 to be more safe in infants and toddlers in comparison to PCV-7. The Immunogenicity of PCV-13 is on the high end on 7 serotypes, in comparison to PCV-7 and immunogenicity is much higher of PCV-13 for other 6 available serotypes.

The ‘Inspire’ project was approved by the institutional review boards at the Johns Hopkins Bloomberg School of Public Health (Baltimore, United States) and the INCLEN Trust International (New Delhi, India).

Review of literature

The burden of S. pneumonia has been an area of interest as it poses a public health problem. A meta-analysis has shown that there was higher carrier rate of s. pneumonia in healthy children, 5 years between the limit of 20% - 93.4% in low income countries. The actual cases were actually higher than were reported in these countries (range, 6.5%–69.8%). The carrier rate was same between rural and urban area in these low-income countries. This was the situation before the introduction of PCV vaccination. (9) Additionally, a meta-analysis of Chinese studies also observed that there was high prevalence of S. pneumoniae in nasopharynx among children and it was found that PCV-7 reduced the colonization of S. pneumoniae in nasopharynx. (10) An US study among children < 18 years also showed that the Pediatric community-acquired pneumonia hospitalization burden was highest among the very young, with respiratory viruses most commonly detected. (11) A prospective study among children <17(The Swiss Pediatric Sepsis Study from 09/2011-12/2015) years reported that the incidence of pneumococcal sepsis remained substantial even after the introduction of PCV-13. The meningitis was reported due to non-vaccine serotype and disease caused by serotype 3 was significant predictors of severity. (12) A population based study which was conducted in Hong Kong to observe the occurrence of hospitalization in pediatric ward for infection of bacterial pneumoniae before universal pneumococcal vaccination. It was observed that the incidence of bacterial pneumonia was 775.7/100,000 and 439.5 /100,000 population as diagnosed by pediatricians & WHO CXR standards.(13)

In Indian, the most common serotypes of *S. pneumoniae* were 1; 5; 7; 33; 6A; 6B;9V; 19A; 19F; 14 and 17. (14) In south Asian countries, a systematic review was done to calculate the extent load of IPD in children between the age group of 1-12 mouths. A prospective study in hospital settings has found the burden of IPD to be 3.57% and the burden of S. Pneumonia causing pneumonia was found to be 15%.In Indian, the 10.58% had IPD of all the children which were admitted to the hospital due to invasive bacterial disease; out of which 24% burden of cases was showed by the infection caused by S. Pneumoniae. when the retrospective study was done in hospital of south Asian countries; the invasive bacterial disease had the burden of 12.8% and in 28% cases, S. Pneumoniae was the causative agent in invasive bacterial disease. (15)This retrospective study was done in children below the age of 5 years and included severe episodes of pneumonia, episodes of pneumonia caused due to pneumococcus and total deaths in children due to pneumonia. This study was concluded in 2010.In India, the burden of

pneumococcal cases & to pneumococcal pneumonia is 24% & in UP;16% & 22% in Bihar; 9% & 12% in MP and 8% & 11% in Rajasthan. In India the incident of pneumococcal pneumonia were 0.56 million (0.49–0.64 million) and incidents of pneumococcal deaths was 105 thousand (92–119 thousand).This all lead to the conclusion that the need of an hour was to improve the approach to health care and the coverage of vaccines for pneumonia prevention has to be increased, specially in the states where the pneumonia incidents were reported to be high like, UP, Rajasthan, Bihar, MP.(16)

Due to the use of antibiotics injudiciously there has been the development of pneumococcal resistance and the same was observed in 2004-2005 in US showing 32.5% of pneumococcal isolates have become resistant to penicillin. (17) An epidemiological study in United States during 2004-2005 observed that penicillin-resistant *S. pneumoniae* population has changed and 32.5% of the pneumococcal isolates were non susceptible to penicillin. (18)

There has been development of different PCV vaccines. PPSV23 was a polysaccharide vaccine whereas PCV-7 and PCV-13 are conjugate vaccines. There is also a need to research into new vaccines mostly probably non- polysaccharide vaccines. (19) Out of which PCV-13 should be preferred in India due to its cost-effectiveness.(14)

The PCV immunization has shown a positive impact on diseases due to pneumococcus. The PCV has led to decrease in hospitalization due to pneumonia significant in young children along with the age groups.(20) The PCV-13 vaccination has reduces the load of IPD as due to the presence of serotype in vaccine, the antibiotic resistance has decreased and the S. Pneumonia now responds better to penicillin and other antibiotics.(21),(22)PCV-7 and PCV-13 has also been found to be immensely useful in reducing the burden of resistant infections.(17)

Aims/Research Question

To evaluate the prevalence and dynamics of pneumococcal nasopharyngeal colonization in healthy children aged 5-59 months.

Methodology:

Type of study: cross sectional descriptive study

Location of study: Palwal, Haryana

Type of data: primary data

Data collection method: random sampling

Sample size: 100 samples

Data analysis: stata

Inclusion criteria: Healthy children of 5-59 months children with parent consent

Exclusion criteria: non eligible age group having chronic disease and Consent not provided

Methodology

Material and Methods:

Setting, Design, and Procedures: The present cross-sectional descriptive study is planned to be conducted in Somaarth DDESS Palwal, which is also a rural field practice area of The INCLEN TRUST INTERNATIONAL, New Delhi. It is spread over an area 251.7sqkm covering 51 villages and three blocks (hathin, palwal and hodal), where a population of 2 lakh people resides.

Sample size: 100

Anganwadi center was selected. All the Anganwadi centers were covered. We started in a clockwise manner. We then selected one village and from there we went in the clockwise manner. Each Anganwadi was contacted and they were informed about it and they further asked the children below the age of 5 years to come and participate. Children were selected on the first come first serve basis.

The well-trained clinician trained us for conducting the clinical examination. Clinical examination was then done, using the stadiometer and infantometer for height along with the bathroom weighing machine for weight.

We then collected NP swab .NP swab were collected in aseptic conditions with the proper way by following WHO's method of collecting the NP swab. Two NP swab were collected, one for the immediate processing and second one is kept for the reference in the future.

Then NP swab was stored and collected in the SDGG media and then further stored in the dry ice box at -4°C and then they were immediate transported within 4 hours to the site lab. In the site lab the sample was stored at -80°C. They were transported to CMC Vellore maintaining the cold chain at -80°C. The samples processing was done at CMC using the equivalent test and the PCR method and using the warrior's methods for serotypes. The results were thus obtained and compiled through a web reach platform managed by the INCLEN Trust International IEO and received for further analysis using stata.

Data collection: In **"Inspire"** we have done paper less study in which we were provided by the tablets which were managed by the central server to the INCLEN IEO. We have developed

the previous study. In this form we take all the information related to the case we take; they are as follow: - The following will be collected of samples:

We have collected the data admission details including three phases:

1. *Demographical history*
2. *Clinical history*
3. *Immunization history*.

Immunization history will be taken on the basis of universal immunization program or NIS (where we take regarding BCG, POLIO, HEPETITIS B Etc). Enrolment of children from community: As for enrolment of children for community site we have to take 8 children per Anganwadi in the age group of 5 -11 months - 4 children ,12-23 months - 2 children ,24 -59 months - 2 children.

At the time of sample collection few Anganwadi centre may refuse to participate or may be closed. In order to reduce dropout & damage rate, we will have to increase the sample size with 10%.

Children aged 5-59 months will be enrolled from the community sites:

Inclusion criteria:

- 5-59 months
- Informed consent will be obtained from parent and legal representative
- Healthy children (will be included who may have running nose)

Exclusion criteria:

- Consent not provided
- Not eligible age group
- chronic disease like (Cardiovascular disease (heart disease), Immunodeficiency /disorder, Sickle cell anemia)

Nasal Swab taken from nasopharynx: We have explained the procedure to the parents for two nasopharyngeal swabs which had been obtained from the eligible children after informed consent.

A sterile flexible nylon NP swab is taken and then inserted in nasopharynx, either right or left and after collecting the swab, it is kept in a vial containing STGG broth.

Storage of samples and maintaining cold chain: These samples have been maintained and transported in ice box to the lab within 4 hours of collection for culturing on site .The samples were properly transported to lab where they are kept under ±80°C in deep freezer with their labelling on it in cryovial box and then they are stored till the transportation of the CMC Vellore and the further processing the CMC.

Definition -

1. **Pneumonia**: It is an acute respiratory infection on which leads to the accumulation of pus and fluid in the alveoli resulting is painful breathing and decreased intake of oxygen. Pneumonia is one of the major cause of child mortality and thus has to be reduced. (23)

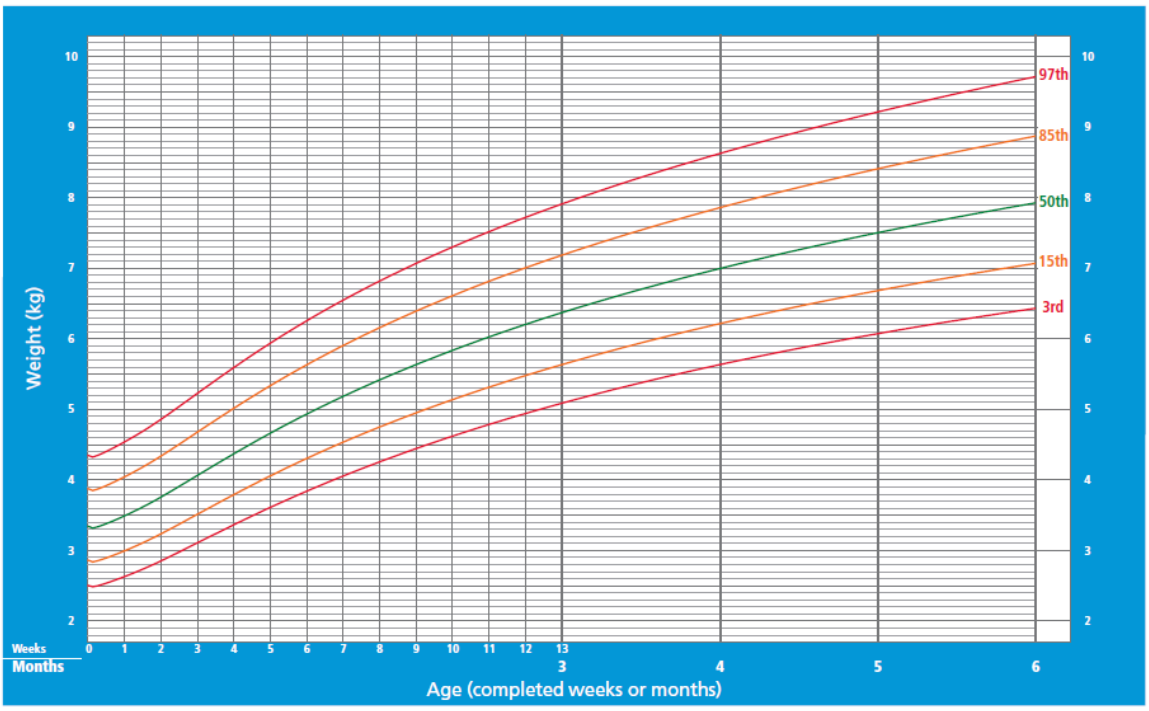
   The WHO has set the guidelines according to an anthropometric measurement including the factors which include the amount of weight required at particular age group; height/length of child expected at particular age group and weight required at particular height of the children. Anthropometric measurements have measured using standard well calibrated measuring equipment and documented. As the CRF is in our tablets, so we were giving the training how to fill it and every information which is required is entered in the tablet.

2. **Weight/age:** The weights were merged without any adjustments and a single model was fitted to generate one continuous set of curves constituting each sex-specific weight-for-age standard. The same power transformation was applied to both boys' and girls' age before fitting the curve construction model. The weight data for both sexes were skewed, so in specifying the model, the parameter related to skewness was fitted in addition to the median and the approximate coefficient of variation. In modelling skewness, the girls' curves required more degrees of freedom to fit a curve for this parameter.

Weight-for-age BOYS

Birth to 6 months (percentiles)

World Health Organization

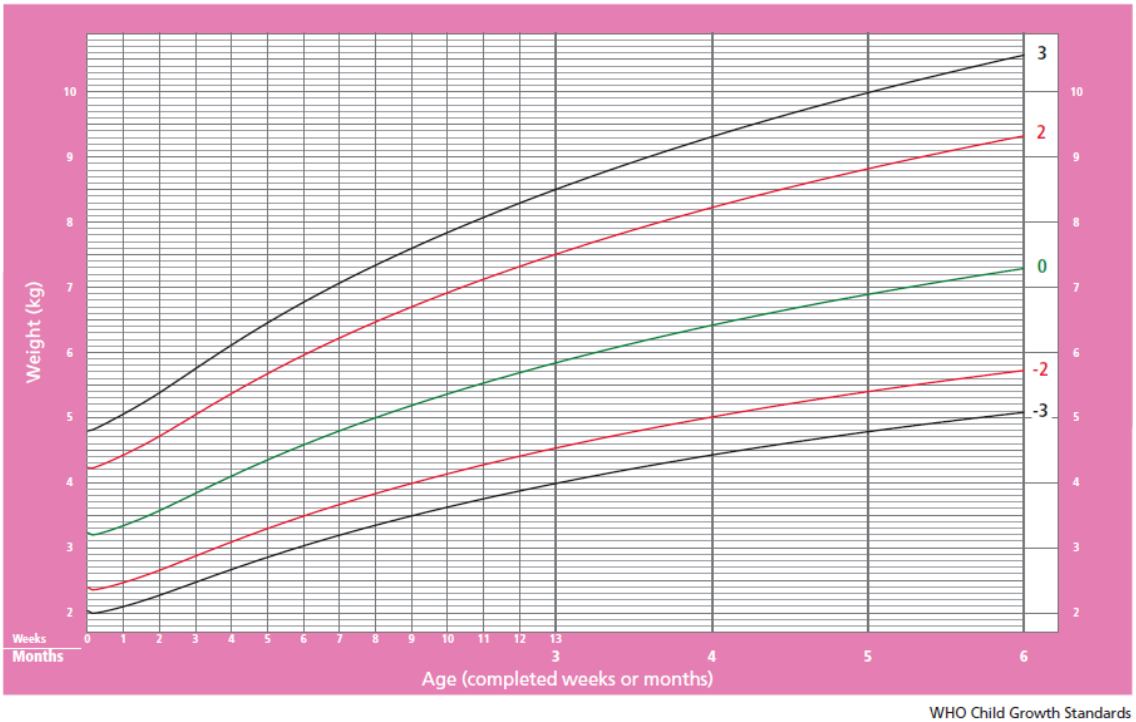


WHO Child Growth Standards

Weight-for-age GIRLS

Birth to 6 months (z-scores)

World Health Organization



WHO Child Growth Standards

3. **Immunization:** In this a person is made resistant by giving the vaccines which activates the body's own immune system against the disease for which the person has been immunized.(24)

Immunization coverage: The global immunization coverage of DPT3 routine immunization is 85% constantly. With additional vaccination of 4.6 million infants due to increase in population worldwide.
Similarly, it is also important to note that although DTP3 coverage in the African region remains at 72% since 2010, the regional target population growth meant that to sustain the same coverage level, about 3.2 million more infants had to be vaccinated in 2017:

Complete immunization: It can be defined when child has received BCG vaccination,3doses of DPT; at least 3 dose of polio vaccine and 1 dose of measles vaccine. (WHO)

Unimmunized: A child is said to be unimmunized it the child is 12-23 months old and has not received any vaccination which he/she should get at that particular age.

Partially immunized child can be explained as the child who has not received all the doses of required vaccination. According to the schedule.

National Immunization Schedule (NIS) for Infants, Children and Pregnant Women

For Infants				
BCG	At birth or as early as possible till one year of age	0.1ml (0.05ml until 1 month age)	Intra-dermal	Left Upper Arm
Hepatitis B – Birth Dose	At birth or as early as possible within 24 hours	0.5 ml	Intra-muscular	Antero-lateral side of mid-thigh
OPV-0	At birth or as early as possible within the first 15 days	2 drops	Oral	Oral
OPV 1, 2 & 3,	At 6 weeks, 10 weeks & 14 weeks	2 drops	Oral	Oral

PCV	(OPV can be given till 5 years of age)			
Pentavalent **1, 2 & 3**	At 6 weeks, 10 weeks & 14 weeks (can be given till one year of age)	0.5 ml	Intra-muscular	Antero-lateral side of mid-thigh
Rotavirus#	At 6 weeks, 10 weeks & 14 weeks (can be given till one year of age)	5 drops	Oral	Oral
IPV	Two fractional doses at 6 and 14 weeks of age	0.1 ml	Intra dermal two fractional dose	Intra-dermal: Right upper arm
Measles /MR 1st Dose$	9 completed months-12 months. (can be given till 5 years of age)	0.5 ml	Sub-cutaneous	Right upper Arm
JE - 1**	9 completed months-12 months.	0.5 ml	Sub-cutaneous	Left upper Arm
Vitamin A (1st dose), PCV Booster	At 9 completed months with measles- Rubella	1 ml (1 lakh IU)	Oral	Oral
For Children				
DPT booster-1	16-24 months	0.5 ml	Intra-muscular	Antero-lateral side of mid-thigh
Measles/ MR 2nd dose $	16-24 months	0.5 ml	Sub-cutaneous	Right upper Arm
OPV Booster	16-24 months	2 drops	Oral	Oral
JE-2	16-24 months	0.5 ml	Sub-cutaneous	Left Upper Arm
Vitamin A* (2nd to 9th dose)**	16-18 months. Then one dose every 6 months up to the age of 5 years.	2 ml (2 lakh IU)	Oral	Oral
DPT Booster-2	5-6 years	0.5 ml.	Intra-muscular	Upper Arm
TT	10 years & 16 years	0.5 ml	Intra-muscular	Upper Arm

Results

The characteristics of groups of children are presented in tables.

Section 1. Socio-demographic characteristics

Table 1: Distribution of study participants w.r.t. select age groups

Age groups	Number of children	Percent (%)
5^{th}-11^{th} months	32	32.00
12^{th} -23^{rd} months	29	29.00
24^{th} -59^{th} months	39	39.00
Total	100	100

Table 1 shows the distribution of study participants according to three age groups a) 5^{th}-11^{th} months, b) 12^{th} -23^{rd} months and c) 24^{th} -59^{th} months. The participants were distributed as 32%, 29% and 39% among these groups respectively.

Table 2: Gender wise distribution of study participants

Gender	Number of children	percent (%)
Male	46	46.00
Female	54	54.00
Total	100	100

Table 2 explains the gender wise distribution of the study participants which consisted of 46% male and 54% female participants.

Table 3: Distribution of study participants w.r.t. immunisation status

Immunization status	Number of children	Percentage (%)
Immunized	88	88.00
Un immunized	8	8.00
Unsure	4	4.00
Total	100	100

Immunisation status of the study participants is described in table 3. 88% of the participants were immunized, 8% were unimmunized and no definitive information was obtained regarding immunization among the rest 4% of the study participants. (table 3)

Section 2. Prevalence of S. pneumoniae among study participants

Table 4: overall prevalence of S. pneumoniae among study participants

S. Pneumoniae in NP sample	Frequency
Present	70
Absent	30
Total	100

Table 4 demonstrates the prevalence of S. pneumoniae in the NP samples of the study participants which was 70%. Rest of the 30% samples were found negative for S. pneumoniae.

Table 5: Serotyping according to PCV-13 among S. pneumoniae positive study participants

Serotype of isolates	Frequency	Percent (%)
Vaccine serotype	39	55.7
Non-vaccine serotype	29	41.4
Serotype Non-typeable	2	2.9
Total	70	100

Among these 70 S. pneumoniae positive study participants 55.7% were having PCV-13 vaccine serotypes, 41.4% were having non-vaccine serotypes and rest of 2.9% could not be serotyped. (table 5).

The prevalence of PCV 13 vaccine type colonization 55.7 (39/70) among community children. The prevalence of colonization with serotype 1,3,4,5,6A,6B,7F,9V,19,18C,19A,19F, and 23F was significantly higher among community children.

Discussion

The study which was carried out in Palwal, Haryana from Feb to Apr 2019, approximately half ie 55.7% of community children were vaccine serotype, 41.7 children were by non-vaccine serotype and others (2.9%) were colonized by different non typable.

The most common colonizing serotypes in this study were 6A, 6B, 19A, 19F, and 23F, which are all included in the PCV13, suggesting that the vaccine has the potential to impact pneumococcal colonization and disease.

In this study increased not only the overall prevalence of colonization but also the number of serotypes detected.

Given the advantages, future colonization studies should consider their use to better estimate colonization and serotype distribution, particularly after vaccine introduction when colonization density of vaccine serotype may be reduced.it will be important for studies to collect accurate information about receipt of routine and pneumococcal vaccine, and strategies will be to improve access to immunization cards. In this study analyze that 88% children are immunized and 8% children are unimmunized 4% children's data we do not have and we are unsure of their immunization status. On this basis, if we look at the broader perspective and analyze the immunization status of whole population, there is a big section of children who are unimmunized and there is another group whose immunization status is oblivious to us. And this bring a very serious problem in front of the health sector; when we want to take steps towards prevention or eradication on of particular disease so we have to take drastic steps for awareness of population and educate them to promote immunization. In India, pneumococcus is a frequent cause of invasive bacterial diseases. It is a common bacterium isolated from children with severe bacterial pneumonia and children with pyogenic meningitis.

Conclusion

This study provides baseline information on the prevalence of serotype specific pneumococcal colonization among children prior to the introduction of PCV 13 in India. Our result suggests a role for pneumococcal vaccine in reducing pneumococcal colonization in India. It is suggested that the ongoing immunization schedule should also include the vaccination by PCV-13. Although this study provides the serotyping and dynamics of pneumococcal vaccination but further studies with larger sample size should be undertaken.

References:

1. WHO | Pneumonia [Internet]. WHO. [cited 2019 May 29]. Available from: https://www.who.int/topics/pneumococcal_infections/en/

2. Zhanel GG, Adam HJ. Introduction to the SAVE study (2011–15): Streptococcus pneumoniae serotyping and antimicrobial susceptibility: Assessment for Vaccine Efficacy in Canada after the introduction of PCV-13. J Antimicrob Chemother [Internet]. 2018 Jul 1 [cited 2019 May 1];73(suppl_7):vii2–4. Available from: https://academic.oup.com/jac/article/73/suppl_7/vii2/5047485

3. Luca DL, Kwong JC, Chu A, Sander B, O'Reilly R, McGeer AJ, et al. Impact of Pneumococcal Vaccination on Pneumonia Hospitalizations and Related Costs in Ontario: A Population-Based Ecological Study. Clin Infect Dis [Internet]. 2018 Feb 1 [cited 2019 Apr 23];66(4):541–7. Available from: https://academic.oup.com/cid/article/66/4/541/4237586

4. Kim L, McGee L, Tomczyk S, Beall B. Biological and Epidemiological Features of Antibiotic-Resistant Streptococcus pneumoniae in Pre- and Post-Conjugate Vaccine Eras: a United States Perspective. Clin Microbiol Rev [Internet]. 2016 Jul [cited 2019 Apr 23];29(3):525–52. Available from: http://cmr.asm.org/lookup/doi/10.1128/CMR.00058-15

5. Chao Y, Marks LR, Pettigrew MM, Hakansson AP. Streptococcus pneumoniae biofilm formation and dispersion during colonization and disease. Front Cell Infect Microbiol [Internet]. 2015 Jan 13 [cited 2019 May 1];4. Available from: http://journal.frontiersin.org/article/10.3389/fcimb.2014.00194/abstract

6. Sazawal S, Black RE. Effect of pneumonia case management on mortality in neonates, infants, and preschool children: a meta-analysis of community-based trials. Lancet Infect Dis [Internet]. 2003 Sep [cited 2019 Apr 24];3(9):547–56. Available from: https://linkinghub.elsevier.com/retrieve/pii/S1473309903007370

7. von Mollendorf C, Tempia S, von Gottberg A, Meiring S, Quan V, Feldman C, et al. Estimated severe pneumococcal disease cases and deaths before and after pneumococcal conjugate vaccine introduction in children younger than 5 years of age in South Africa.

PLoS ONE [Internet]. 2017 Jul 3 [cited 2019 May 14];12(7). Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5495214/

8. Taneja D, Malik A. Conjugate pneumococcal vaccines: Need and choice in India. Indian J Community Med [Internet]. 2013 [cited 2019 Apr 24];38(4):189. Available from: http://www.ijcm.org.in/text.asp?2013/38/4/189/120140

9. Adegbola RA, DeAntonio R, Hill PC, Roca A, Usuf E, Hoet B, et al. Carriage of Streptococcus pneumoniae and Other Respiratory Bacterial Pathogens in Low and Lower-Middle Income Countries: A Systematic Review and Meta-Analysis. Reid SD, editor. PLoS ONE. 2014 Aug 1;9(8):e103293.

10. Wang L, Fu J, Liang Z, Chen J. Prevalence and serotype distribution of nasopharyngeal carriage of Streptococcus pneumoniae in China: a meta-analysis. BMC Infect Dis. 2017 Dec;17(1):765.

11. Jain S, Williams DJ, Arnold SR, Ampofo K, Bramley AM, Reed C, et al. Community-Acquired Pneumonia Requiring Hospitalization among U.S. Children. N Engl J Med. 2015 Feb 26;372(9):835–45.

12. Asner S, Waters V, Solomon M, Yau Y, Richardson SE, Grasemann H, et al. Role of respiratory viruses in pulmonary exacerbations in children with cystic fibrosis. J Cyst Fibros. 2012 Sep;11(5):433–9.

13. Chiu SS, Ho P-L, Khong P-L, Ooi C, So LY, Wong WHS, et al. Population-based incidence of community-acquired pneumonia hospitalization in Hong Kong children younger than 5 years before universal conjugate pneumococcal immunization. J Microbiol Immunol Infect. 2016 Apr;49(2):225–9.

14. Taneja D, Malik A. Conjugate pneumococcal vaccines: Need and choice in India. Indian J Community Med. 2013;38(4):189.

15. Jaiswal N, Singh M, Thumburu KK, Bharti B, Agarwal A, Kumar A, et al. Burden of Invasive Pneumococcal Disease in Children Aged 1 Month to 12 Years Living in South Asia: A Systematic Review. Bhutta ZA, editor. PLoS ONE. 2014 May 5;9(5):e96282.

16. Farooqui H, Jit M, Heymann DL, Zodpey S. Burden of Severe Pneumonia, Pneumococcal Pneumonia and Pneumonia Deaths in Indian States: Modelling Based Estimates. Hill PC, editor. PLOS ONE. 2015 Jun 18;10(6):e0129191.

17. Kim L, McGee L, Tomczyk S, Beall B. Biological and Epidemiological Features of Antibiotic-Resistant Streptococcus pneumoniae in Pre- and Post-Conjugate Vaccine Eras: a United States Perspective. Clin Microbiol Rev. 2016 Jul;29(3):525–52.

18. Richter SS, Heilmann KP, Dohrn CL, Riahi F, Beekmann SE, Doern GV. Changing Epidemiology of Antimicrobial-Resistant *Streptococcus pneumoniae* in the United States, 2004–2005. Clin Infect Dis. 2009 Feb;48(3):e23–33.

19. Daniels CC, Rogers PD, Shelton CM. A Review of Pneumococcal Vaccines: Current Polysaccharide Vaccine Recommendations and Future Protein Antigens. J Pediatr Pharmacol Ther. 2016 Jan;21(1):27–35.

20. Luca DL, Kwong JC, Chu A, Sander B, O'Reilly R, McGeer AJ, et al. Impact of Pneumococcal Vaccination on Pneumonia Hospitalizations and Related Costs in Ontario: A Population-Based Ecological Study. Clin Infect Dis. 2018 Feb 1;66(4):541–7.

21. Izurieta P, Bahety P, Adegbola R, Clarke C, Hoet B. Public health impact of pneumococcal conjugate vaccine infant immunization programs: assessment of invasive pneumococcal disease burden and serotype distribution. Expert Rev Vaccines. 2018 Jun 3;17(6):479–93.

22. Zhanel GG, Adam HJ. Introduction to the SAVE study (2011–15): Streptococcus pneumoniae serotyping and antimicrobial susceptibility: Assessment for Vaccine Efficacy in Canada after the introduction of PCV-13. J Antimicrob Chemother. 2018 Jul 1;73(suppl_7):vii2–4.

23. Pneumonia [Internet]. [cited 2019 May 1]. Available from: https://www.who.int/news-room/fact-sheets/detail/pneumonia

24. WHO | Immunization [Internet]. WHO. [cited 2019 May 6]. Available from: http://www.who.int/topics/immunization/en/