UTILITY OF IMPLEMENTING INTEGRATED MANAGEMENT OF NEONATAL AND CHILDHOOD ILLNESS (IMNCI) ALGORITHM IN A TERTIARY CARE HOSPITAL FOR THE YOUNG INFANTS OF AGE 0-2 MONTHS

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ABSTRACT

BACKGROUND

Most deaths in post-neonatal, under-5 children are due to infectious causes with the three major killers being diarrhoea, pneumonia and malaria. The aim of the study is to evaluate the utility of implementing Integrated Management of Neonatal and Childhood Illness (IMNCI) algorithm in reducing the morbidity and mortality in infants of 0-2 months. To check the validity and reliability of IMNCI algorithm for young infants (0-2 months).

MATERIALS AND METHODS

It is a prospective observational study conducted in the Department of Paediatrics of MGM Hospital, Kakatiya Medical College, Warangal, India, during the period of January 2013 to September 2014. The subjects were enrolled as and when they came in contact with study team, in both the Outpatient Department (OPD), PICU and SNCU so that illnesses of varying severity could be evaluated. A total of 500 infants are included in the study.

RESULTS

In the present study, the sensitivity of IMNCI criterion in correctly identifying sick infants of age 0-2 months is 90.02%, specificity is 63.10%, positive predictive value being 92.44% and negative predictive value is 55.79%.

CONCLUSIONS

IMNCI ensures the combined treatment of the major childhood illnesses emphasising prevention of disease through immunisation and improved nutrition. Based on the above study results, sensitivity of the present study is 90.2% indicating it is an effective tool for early identification and referral of sick young infants.

KEYWORDS

IMNCI, Under 5 Children, Algorithm.

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BACKGROUND

Globally, close to 10 million children including 4 million neonates die each year.[1-5] About 7.6 million children died globally in 2010 before reaching their 5th birthday; an improvement from 9.6 million in the year 2000. Newborn deaths are an increasing proportion of the under-5 deaths: 43% in 2011 up from 37% in 1990.

About 7.6 million children died globally in 2010 before reaching their 5th birthday; an improvement from 9.6 million in the year 2000. Newborn deaths are an increasing proportion of the under-5 deaths: 43% in 2011 up from 37% in 1990. The major causes of neonatal deaths are complications of prematurity, intrapartum-related deaths ('birth asphyxia') and severe neonatal infections (pneumonia, sepsis or meningitis). Most deaths in post-neonatal under-5 children are due to infectious causes with the three major killers being diarrhoea, pneumonia and malaria.

Effective interventions exist to address all of the main causes of child deaths, but the infrastructure required to make these available on a timely basis is not present. A holistic approach to provide a continuum of care from conception to adulthood is needed to ensure that the progress is made towards the Millennium Development Goals.

Ending preventable child deaths requires global commitments to ambitious and achievable targets through evidence-based country plans, expanding country/stakeholder engagement, creating transparency and accountability and devising new approaches when needed.

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Reduction in child and neonatal mortality are major public and global health challenges.[6] The Fourth Millennium Development Goal (MDG-4) represents commitment to reduce mortality in children younger than 5 years by two third between 1990 and 2015.[7-9] Input of effects between 1960 and 2000 resulted in reduction of child mortality, unfortunately the Neonatal Mortality Rate (NMR) could not be reduced desirably.[9,4] To meet the MDG-4, a substantial reduction in child mortality especially neonatal mortality in high mortality countries is needed. Major reductions in under five mortality could be achieved through provision of individualised clinical care especially for neonates.[10,4,11]

OBJECTIVES OF THE STUDY

1. To evaluate the utility of implementing Integrated Management of Neonatal and Childhood Illness (IMNCI) algorithm in reducing the morbidity and mortality in infants of 0-2 months.
2. To check the validity and reliability of IMNCI algorithm for young infants (0-2 months).

MATERIALS AND METHODS

It is a prospective observational study conducted in the Department of Paediatrics of MGM Hospital, Kakatiya Medical College, Warangal, India, during the period January 2013 to September 2014. The study was spread over 20 months' duration to minimise the seasonal variation in morbidities. The subjects were enrolled as and when they came in contact with study team in both the Outpatient Department (OPD), PICU and SNCU so that illnesses of varying severity could be evaluated. A total of 500 infants are included in the study.

Study Sample

Consecutive sample of young infants of outpatient department and young infants admitted in SNCU whose parents are consenting.

Inclusion Criterion

1. Young infants (0-2 months) who presented to OPD or emergency room of the treating unit.
2. Infants who have not received any treatment for the present condition before approaching to M.G.M. Hospital only are included in the study.

Exclusion Criterion

Infants who have received treatment for the present complaint in other healthcare centre.

Parental consent for inclusion in the study and for follow up visit was taken in every case.

After collecting the necessary information from the mother or informant, the data of each infant was systematically compiled and classified into a case analysis sheet and is further used for statistical purpose.

Statistics

It is a hospital-based prospective observational study using data so obtained were analysed using Epi info software.

Results and Analysis

It is a hospital-based prospective observational study using data so obtained were analysed using Epi info software.

RESULTS

	Total Admissions	0-7 Days	8 Days-2 Months
OPD	124/158 (78.48%)	45 (84.90%)	79 (75.23%)
SNCU	328/342 (95.9%)	146 (96.07%)	182 (96.2%)

Table 1. Showing Admitted Cases from OPD and SNCU

	Total Cases n=500	0-7 Days	8 Days-2 Months
OPD*	158 (31.6%)	53 (33.5%)	105 (66.5%)
SNCU*	342 (68.4%)	153 (45%)	189 (55%)

Table 2. Age-Wise Recruitment of Cases from OPD and SNCU (Emergency)

OPD- outpatient department. SNCU- special newborn care unit.

Sex	Total n=500
Male	284 (56.8%)
Female	216 (43.2%)

Table 3. Distribution of Cases Based on Sex

Illness	0-7 Days	8 Days-2 Months	Total (n=500)
Possible serious bacterial infection	73 (47.4)	81 (52.5)	154
Local bacterial infection	2 (66.6)	1 (33.3)	3
Jaundice	51 (54.2)	43 (45.7)	94
Diarrhoea	10 (25.6)	29 (74.3)	39
Breast fed stools	6 (37.5)	10 (62.5)	16
Low/very low weight for age	68 (75.5)	22 (24.4)	90
Birth asphyxia	24	0	24
Meconium aspiration syndrome	15	0	15
Transient tachypnoea of newborn	3	0	3
Respiratory distress syndrome	7	0	7
Upper respiratory infection	0	14	14

Bronchiolitis	0	9	9
Conjunctivitis	2 (66.6)	1 (33.3)	3
Others*	8 (27.5)	21 (72.4)	29

Table 4. Morbidity Profile [Number (%)] As Per the "Gold Standard"

Others

*Included congenital heart disease, neonatal seizures, haemorrhagic disease of newborn, hypocalcaemia, cephalhematoma, Down's syndrome, umbilical granuloma, intracranial haemorrhage, rickets, regurgitation of feeds and surgical conditions.

Illness	Total n=500
Possible serious bacterial infection	300 (60%)
Local bacterial infection	3 (0.6%)
Jaundice	99 (19.8%)
Diarrhoea	41 (8.2%)
Low/very low weight for age	57 (11.4%)

Table 5. Morbidity Profile [Number (%)] As Per the "IMNCI Algorithm"

60% of the morbidity is due to possible serious bacterial infections.

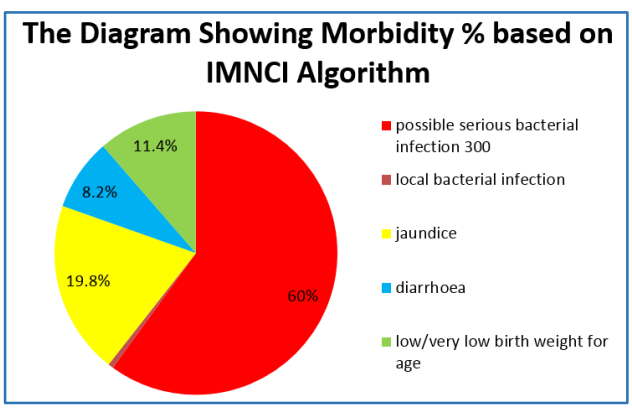

Figure 1.

Immunisation Status	Total (n=500)
Completely immunised	424 (84.8%)
Partially immunised	68 (13.6%)
Not immunised/immunisation status not known	8 (1.6%)

Table 6. Showing the Immunisation Status of the Study Group

84.8% of the study group are completely immunised.

Type of Mismatch	Total n=500
No mismatch	379 (75.8)
Difference in diagnosis	53 (10.6)
Under diagnosis	42 (8.4)
Over diagnosis	31 (6.2)

Table 7. Showing the Diagnostic Agreement between the Gold Standard and IMNCI Algorithm

75.8% of the cases who were evaluated as per IMNCI algorithm are in agreement with gold standard.

Distribution of validity and reliability characteristics of IMNCI classification in identifying sick infants.

Sensitivity 90.02.

Specificity 63.10.

Positive predictive value 92.44.

Negative predictive value 55.79.

Outcome	n=500
Recovered	439 (87.8%)
Death	26 (5.2%)
LAMA*	35 (7%)

Table 8. The Outcome of the Cases Evaluated as per the IMNCI

87.8% of the cases evaluated have recovered, LAMA= left against medical advice.

IMNCI Classification	Sensitivity	Specificity	Positive Predictive Value	Negative Predictive Value
Possible serious bacterial infection	85.26%	69.2%	33.28%	95%
Jaundice	61.3%	95%	81.4%	94.6%
Diarrhoea	22%	90.4%	21%	89.2%

Table 9. Showing Distribution of Validity and Reliability Characteristics of IMNCI Classification, Against Gold Standard N=500

DISCUSSION

Integrated Management of Neonatal and Childhood Illness (IMNCI) is already operational at the field level in India, but there is paucity of published study testing its validity and reliability.

In the present study, 78.48% infants from OPD were admitted; in these 84.9% belonged to 0-7 days age group, 73.23% belonged to 8 days-2 months age group.

Compared to patients recruited from OPD, emergency recruits were significantly more likely to be hospitalised (95.9%). Infants of 0-7 days age group constituted 96.07% and 96.2% belonged to 8 days to 2 months age group, while Kaur et al[12] also showed similar percentages 85.4% vs. 96.3% in 0-7 days group and 8 days to 2 months group, respectively.

In the present study, age-wise recruitment of cases is 31.6% from OPD and 68.4% from SNCU, while in Kaur et al[12] study it is 29.6% from OPD and 70.4% from SNCU. 56.8% of the admitted infants were male and 43.2% were female.

In the present study, 84.8% of infants are completely immunised, 13.6% are partially immunised and 1.6% were

either not immunised or their immunisation status was not known.

In the present study, the important provisional diagnoses are possible serious bacterial infection (60%), followed by jaundice (19.8%), followed by low/very low weight for age (11.4%), followed by diarrhoea (8.2%).

In case of possible serious bacterial infection in the present study, sensitivity is 85.26%, specificity is 69.2%, positive predictive value being 33.28% and negative predictive value being 95%.

The fever, which is very much common particularly in an overheated nursery, might be an important cause of over diagnosis of possible serious bacterial infection. In the study by Goswami, Singh, Dutta,[13] algorithm tends to over diagnose serious bacterial infection by 8-20% (in three age groups).

In cases of jaundice in the present study, sensitivity is 61.3%, specificity is 95%, positive predictive value 81.4%, negative predictive value 94.6%. According to the study done by Bhattacharya[14] in 2011, sensitivity was 66.67% whereas the specificity was 99.07. Paediatricians diagnosed all relevant cases as jaundice; clinically, they did not categorise any case as severe jaundice.

However, in the algorithm when the jaundice appears in the 1st day of life or persists for more than 14 days and extends in the palms and soles, it was classified as severe jaundice. In the study done by Kaur, Singh, Dutta, Chandra,[12] the algorithm under-diagnosed the severity of jaundice in few subjects (12/131) and over-diagnosed (8/131) the severity in few subjects.

For diarrhoea in algorithm, the sensitivity is 22%, specificity is 90.4%, positive predictive and negative predictive value being 21% and 89.2%, respectively. The sensitivity was 25% whereas the specificity was 94.50% in the study done by Bhattacharya and associates.[14] Probability of low sensitivity might be due to some cases like lactose intolerance, breastfed loose stool and not consideration of urination status by the algorithm. In the study done by Kaur, Singh, Dutta, Chandra[12] of the 76 cases identified as diarrhoea by the algorithm, 22 (29%) had breastfed stools.

As the incidence of local bacterial infection in the present study is very low (3 out of 500 cases), the statistical analysis could not be interpreted.

In the present study, the sensitivity of IMNCI criterion in correctly identifying sick infants of age 0-2 months is 90.02%, specificity is 63.10%, positive predictive value being 92.44% and negative predictive value is 55.79%. In the study done by Kaur et al,[12] the sensitivity of IMNCI criteria in correctly identifying infants needing referral was 95% and the specificity was 87%, 0-2 months. The positive predictive value and negative predictive values for these age groups were 97% and 78%, respectively.

The results of the study done by Kundan Mittal,[15] Indian Journal of Paediatrics, August-2014-Evaluation of IMNCI Algorithm for the diagnosis an management in under five children showed the sensitivity of 97.5% and specificity of 49.2% in 0-7 days age group and in the age group of 7 days to 2 months, sensitivity of 96.4% and specificity of 11.1%. The reason for poor specificity in the early neonatal period was identifying every case of respiratory distress and lethargy as possible serious bacterial infection.

CONCLUSIONS

Implementation of IMNCI, as envisioned in the government's strategic plan is feasible in India at scale and results in improved infant survival. Sensitivity of the present study is 90.2% indicating it is an effective tool for early identification and referral of sick young infants. IMNCI algorithm for young infants (0-2 months) adapted for use in India appropriately identifies and refers sick young infants including those between 0-7 days of age. For effective skill retention, there is a need to strengthen implementation of IMNCI with specific attention to supportive supervision, timely refresher courses, maintenance of constant drug supply, strong referral mechanism and general system strengthening.

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