

A comparative study to evaluate diagnostic agreement of IMNCI algorithm in young infants

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Abstract

Background: Under-five and infant mortality constitutes a major health problem in India. To combat this high mortality, IMCI strategy aiming at holistic and integrated approach to child health and development was developed by WHO. This study is a comparative study conducted at Emergency and Outpatient Department of Pediatrics FHMC Tundla and SNMC Agra. Total of 200 young infants (0-2months) were taken. Detailed history and examination was done for all enrolled young infants according to IMNCI and for enrolled infants diagnosis and treatment was made in the Pediatric Department and was considered as Gold Standard. **Results:** Out of total 200 young infants, 117 were 0-7 days of age and rest 83 were 7- 59 days of age. Of these 109 infants were admitted, and 91 infants were sent home after initial management. There was no mismatch in diagnosis of 48% infants, while partial mismatch in 38.5% infants, over diagnosis in 10.5% and under diagnosis was present in 3% infants of 0-2 months of age. **Conclusion:** This study had good diagnostic agreement and only 3% of infants were underdiagnosed.

Keywords: IMCI, Diagnostic Agreement, Childhood Illness, Integrated Management of Childhood Illness

Introduction

Globally, close to 10 million children including 4 million neonates die each year [1,2,3,4,5]. In response to this challenge, WHO and UNICEF in the early 1990s developed Integrated Management of Childhood Illness (IMCI), a strategy designed to reduce child mortality and morbidity in developing countries [6]. This strategy combines improved management of childhood illness with aspects of nutrition, immunization and other important disease prevention and health promotion elements [7,8]. However, before widespread implementation, the IMCI algorithms require careful evaluation to reflect the epidemiological and cultural characteristics of the country and adaptations as per the regional morbidity patterns [9,10,11].

Under-five and infant mortality constituted a major health problem in India. To combat the challenge of high under-five mortality, IMCI strategy aiming at holistic and integrated approach to child health and development was developed by WHO, but it did not include the early neonatal period (0-7 days) due to programmatic reasons.

This generic algorithm has been adapted to cover the 0-7 days age in India and is termed Integrated Management of Neonatal and Childhood Illness (IMNCI). Various studies from India and other developing countries have validated the IMCI algorithm in both 7 days – 2 months and 2 months-5 years age groups [12-14]. The signs and symptoms of several of the major childhood illnesses contributing to under-five mortality have a substantial overlap.

Thus, a single diagnosis for a sick child is often inappropriate because it identifies only the most apparent problem and can lead to an associated and potentially life-threatening problem being overlooked. For effective management of these major childhood illnesses, WHO and UNICEFF have developed the “Integrated Management of Childhood Illness” (IMCI) Strategy [15,16].

IMNCI aims to reduce death, illness and disability, and to promote improved growth and development among children under 5 years of age. IMNCI includes both preventive and curative elements that implemented by families and communities as well as by health facilities [17].

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Materials and Methods

Study design: Comparative study.

Place: Emergency and Outpatient Department of Pediatrics FHMC Tundla and SNMC Agra

Study duration: One Year (Jan 2018 to Dec 2018)

Sample size: Total of 200 young infants were taken from Emergency and Outpatient Department of Pediatrics.

Inclusion criteria: Any infant presented with a fresh episode of any illness in the Emergency or the Outpatient Department of the Pediatrics in BPKIHS.

Exclusion criteria: Infants attended the well baby clinic or immunization clinic for routine visits.

Methods

Young infants presenting to OPD and Emergency of pediatrics for fresh illness were included in the study.

Results

In this study out of 200 young infants, 117 were 0-7 days of age and rest 83 were 7 - 59 days of age as shown in Table 1.

Table-1: Age distribution of study infants.

	Number	Percent (%)
0-7 days	117	58.5%
7 days-2 months	83	41.5%
Total	200	100%

Total of 200 young infants were included in the study, of which 61.5% were male and 38.5% were female infants as shown in Table 2.

Table-2: Sex distribution of study infants (0-2 months).

	Number	Percent (%)
Male	123	61.5%
Female	77	38.5%
Total	200	100%

There were 58.1% males and 41.9% females in age group 0-7 days of age group as shown in Table 3.

Table-3: Sex distribution of study infants (0-7days).

	Number	Percent (%)
Male	68	58.1%
Female	49	41.9%
Total	117	100%

There were 66.2% males and 33.8% females in infants 7 days to 2 months of age group as shown in Table 4.

Table-4: Sex distribution of study infants (7days-2 months).

	Number	Percent (%)
Male	55	66.2%
Female	28	33.8%
Total	83	100%

Detailed history and examination were done for all enrolled young infants and was recorded in proforma according to IMNCI and for enrolled infants diagnosis and treatment was made in the Pediatric Department and was considered as Gold Standard. All the relevant investigations were sent and treated accordingly in the department of pediatrics.

Statistical analysis: The data was evaluated in the predesigned proforma, data were entered into MS Excel and analyzed using SPSS 10.01 for window 7, chi square test and fisher's exact test, sensitivity, specificity, positive predictive value and negative predictive value.

The broad treatment agreement was compared using descriptive statistics and using statistical tests of significance wherever possible.

A total of 100 infants were recruited each from the OPD and Emergency. Out of which 109 infants were admitted, and 91 infants were sent home after initial management as shown in Table 5.

Table-5: Relationship between recruitment and hospitalization (0-2months).

	Admitted	Sent Home	Total
OPD	21	79	100
Emergency	88	12	100
Total	109	91	200

There were total of 72 admissions, 4 from OPD and 68 form emergency and rest 45 were sent home in 0-7 days age group as shown in Table 6.

Table-6: Relationship between recruitment and hospitalization (0-7 days).

	Admitted	Sent Home	Total
OPD	4	38	42
Emergency	68	7	75
Total	72	45	117

There were 37 admission and rest 46 infants were sent home in 7days – 2 months of age as shown in Table 7.

Table-7: Relationship between recruitment and hospitalization (7-59 days).

	Admitted	Sent Home	Total
OPD	17	41	58
Emergency	20	5	25
Total	37	46	83

It was observed that out of 200 infants included in study, 21 (10.5%) infants died and 179 (89.5%) recovered and discharged from hospital.

In this study diagnostic agreement between the IMNCI and Gold standard were compared. Those infants which were referred with one or more diagnosis or sent home according to IMNCI and was admitted to hospital or sent home with same diagnosis was considered as No Mismatch. Those infants which were referred with one or more illnesses according to IMNCI and was admitted with difference in one or more diagnosis according to Gold Standard was considered as Partial Mismatch. Infants which were referred according to IMNCI module and was sent home according to Gold Standard was considered as Overdiagnosis. Those infants which were sent home according to IMNCI module and was admitted in hospital as per Gold Standard was considered as Underdiagnosis.

There was no mismatch in diagnosis in 48% infants while partial mismatch was present in 38.5% infants. Over diagnosis was present in 10.5% and under diagnosis was present in 3% of 0-2 months of age young infants as shown in Table 8.

Table-8: Diagnostic agreement between gold standard and IMNCI Algorithm (0-2 months).

Type of mismatch	Number	Percentage (%)
No mismatch	96	48%
Partial mismatch	77	38.5%
Over-diagnosis	21	10.5%
Under-diagnosis	6	3%
Total	200	100%

There was no mismatch in 45.3%, partial mismatch in 36.7%, over-diagnosis in 14.5% and under-diagnosis in 3.5% of infants in 0- 7 days of age respectively as depicted in Table 9.

Table-9: Diagnosis agreement between gold standard and IMNCI algorithm (0-7 days).

Type of mismatch	Number	Percentage (%)
No mismatch	53	45.3%
Partial mismatch	43	36.7%
Over-diagnosis	17	14.5%
Under-diagnosis	4	3.5%
Total	117	100%

There was no mismatch in 51.8%, partial mismatch in 41%, over-diagnosis in 4.8% and under-diagnosis in 2.4% of infants in 0-7 days of age as depicted in Table 10.

Table-10: Diagnostic agreement between gold standard and IMNCI Algorithm (7 days – 2 months).

Type of mismatch	Number	Percentage (%)
No mismatch	43	51.8%
Partial mismatch	34	41.0%
Over-diagnosis	4	4.8%
Under-diagnosis	2	2.4%
Total	83	100%

Discussion

A total of 200 infants between 0-2 months who fulfilled the study criteria were investigated. Of these 117 (58.5%) were 0-7 days of age and rest 83(41.5%) were 7 to 59 days of age. Similar study conducted by Kaur et al [18] showed that 42% infants were 0-7 days and 58% infants were 7 days to 2 months of age which is almost similar to the present study.

In the current study, 61.5% infants were male and 38.5% infants were female. In this study total of 54.5% infants were admitted and rest 45.5% were sent home. Admitted babies were significantly higher in Emergency group as compared to the OPD in 0-7 days as 90.6% and 9.5% and 7-59 days was 80% and 29.3% respectively.

In similar study conducted by Kaur et al [18] admission from emergency and OPD in 0-7 days was 96.3% and 85.4% and 7-59 days were 97.5% and 38.6% respectively. Higher percentage of admission in this study may be due to difference in study settings but a greater number of admissions from emergency is comparable.

Similar study conducted by Goswami et al [14] showed that 66% of infants in early neonatal period (0-7 days) were admitted as compared to 52% in 7 days-2 months age groups that was corresponding to the present study. Other study conducted by Gupta et al [13] showed that 65.7% of infants were admitted and rest 34.3% were sent back home in 7 days -2 months age groups.

In this study no mismatch or complete diagnostic agreement was present in nearly half (48%) of infants, partial mismatch was there in 38.5% infants, overdiagnosis was present in 10.5% and underdiagnosis was present in 3% infants. Subdividing the data to 0-7 days age group, complete agreement, partial mismatch, over diagnosis and under diagnosis was 45.3%,36.7%, 14.5%, 3.5%- and 7-59-days age group was 51.8%, 41.0%, 4.8%, 2.4% respectively. Kaur et al [18] had complete diagnostic agreement, partial mismatch, overdiagnosis, under-diagnosis in 0-7 days as 40.3%, 31.3%, 15.9%, 12.5% and 7- 59 days as 55.9%,10.3%, 20.6%, 13.2% respectively. The diagnostic agreement percentage in this study was comparable to the present study.

Another study conducted by Goswami et al [14] showed that no mismatch, partial mismatch, overdiagnosis underdiagnosis was 57%, 42%, 16%, 87% in 0-7 days age group and 68%, 32%,72%, 29% in 7-59 days age group respectively which is comparable. Gupta et al [13] conducted study in 7-59 days age group and showed that complete agreement was present in 60% young infants. Partial mismatch, overdiagnosis, underdiagnosis was 40%, 21%, and 22.5% respectively which is comparable to the present study.

Another study conducted by Bhattacharya et al [19] showed that IMNCI algorithm decisions were compared with the pediatrician's decisions and it was revealed that

the overall diagnostic agreement was 55.56%, and among the disagreements, 33.33% was due to over diagnosis, and 11.11% was due to under diagnosis.

Another similar study by Thummakomma et al [20] which included 500 young infants showed that there was no mismatch in diagnosis in approximately 75% of study infants which is much more as compared to the present study.

Partial mismatch was present in 10% infants, under diagnosis in 8% infants, and overdiagnosis in 6% infants. Combination of no mismatch and partial mismatch is almost comparable to the present study.

Study Limitations- Although the gold standard diagnosis and treatment were done by the consultants in Pediatrics department but the IMNCI proforma filled by the researchers were not blinded. Hence, possibility of bias cannot be ruled out.

Conclusion

This study was done to compare IMNCI algorithm with the diagnosis of Pediatricians at a tertiary care centre in 0-2 months age group. In this study out of total 200 infants, 54.5% were admitted and rest 45.5% were sent home. This study had no mismatch or complete diagnostic agreement 48% of infants, partial mismatch in 38.5% infants, overdiagnosis in 10.5% and underdiagnosis was present in only 3% infants.

What this study adds to existing knowledge?

IMNCI Algorithm had a good diagnostic agreement, only very few infants were underdiagnosed as compared to paediatrician diagnosis. Hence it is an important algorithm for the diagnosis of illnesses in young infants (0-2 months).

Author's Contribution

Dr. Rishi Bansal: Conceived the idea of study, did data collection, supervised the study, analysis of data and interpretation of results, participated in study design, write up the manuscript.

Dr. Ram Kshitij Sharma: Data collection, supervised the study, analysis of data and interpretation of results, reviewed related literature, and write up of manuscript.

Dr. Madhu Nayak: Reviewed related literature and write up of manuscript.

Dr. Shehraz Firoz: Reviewed related literature and write up of manuscript.

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