Section: Community Medicine

Original Research Article

# KNOWLEDGE AND FUNCTIONAL ASSESSMENT OF ANGANWADI WORKERS UNDER THE ICDS SCHEME IN GWALIOR CITY, M.P

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***Received*** *: 15/07/2025*
***Received in revised form*** *: 26/08/2025*
***Accepted*** *: 17/09/2025*

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**DOI:** 10.70034/ijmedph.2025.3.629

**Source of Support:** Nil,
**Conflict of Interest:** None declared

**Int J Med Pub Health**
2025; 15 (3); 3438-3445

ABSTRACT

**Background:** India's Integrated Child Development Services (ICDS) relies on Anganwadi Workers (AWWs) to deliver nutrition, health, and early learning. Translating wide coverage into quality outcomes requires adequate infrastructure, reliable supplies, and strong frontline knowledge. The objective is to assess infrastructure and service delivery at Anganwadi Centres (AWCs) and to evaluate AWWs' knowledge across key ICDS domains in Gwalior, Madhya Pradesh.

**Materials and Methods:** A citywide, observational cross-sectional study (1 Jan 2021–30 Jun 2022) sampled 265 AWCs via stratified random sampling from 754 centres across six zones. Data were collected using a pre-designed, pre-tested, interview-based questionnaire covering infrastructure, logistics, services, records, and knowledge (SN, growth monitoring, immunisation, IYCF/NHE). Analyses used SPSS v23.0; descriptive statistics and chi-square tests ($p<0.05$).

**Results:** AWWs were predominantly 21–40 years (71.3%); 82.3% were graduates/postgraduates. Infrastructure gaps were prominent: inadequate space 76.2%, poor ventilation 79.6%, no electricity 73.2%; toilets and drinking water were available in 78.1% and 82.3%, respectively; medicines in stock in 15.5%. Most centres had two rooms (89.4%), own buildings (56.6%), separate cooking space (92.8%), and phone connectivity (95.1%). Service enablers included SN provision 95.1%, growth charts 76.2%; however, PSE materials 39.6%, electronic scales 43.4%, MUAC tapes 17.4%. Coverage: TT to all pregnant women in 44.2% AWCs; early ANC registration to all in 40.0%; child health services to all in 25.7%. Knowledge was high for immunisation 96.2% and growth monitoring 94.3%, but lower for EBF to 6 months 41.0%, ORS discard after 24 h 38.0%, MUAC colour coding 38.9%, growth monitoring from birth 30.9%, and correct child SN norm (500 kcal/15 g) 25.7%.

**Conclusion:** While coverage and core knowledge are strong, foundational infrastructure, logistics (weighing/MUAC, medicines, PSE kits), and critical counselling competencies (IYCF, diarrhoea care, MUAC) need targeted strengthening. Priorities include basic facility upgrades, stabilized supplies, focused micro-trainings with job-aids, supportive supervision, streamlined records, and performance-linked incentives.

**Keywords:** ICDS, Anganwadi Workers, Gwalior, infrastructure, supplementary nutrition, growth monitoring, IYCF, MUAC, India.

## INTRODUCTION

India's entrenched social hierarchies, regional diversity, and heterogeneity have long translated into uneven access to nutrition and health services. Despite steady progress, undernutrition among under-five children remains a formidable public-health challenge, contributing substantially to preventable morbidity and mortality. In 2020, the under-five mortality rate stood at ~32 per 1,000 live births, underscoring the urgency of early-life interventions.[1] Corroborating this burden, NFHS-5 reports that 32.1% of Indian children under five are underweight, reflecting the persistence of chronic energy deficiency and intergenerational disadvantage.[2] Against this backdrop, the Integrated Child Development Services (ICDS)—launched in 1975—continues to be India's flagship platform for convergent early childhood care, combining nutrition, health, and pre-school education at the community level.[3]

At the heart of ICDS is the Anganwadi Centre (AWC), operationalized by Anganwadi Workers (AWWs) supported by helpers, who together deliver a package of six services: supplementary nutrition, pre-school non-formal education, nutrition and health education, immunization, health check-up, and referral. The programme's scale is unparalleled: as of March 31, 2021, an estimated 675.07 lakh children and 156.73 lakh pregnant and lactating women were receiving supplementary nutrition through AWCs.[4] Given this reach, the knowledge, skills, and functional performance of AWWs are pivotal determinants of programme effectiveness—shaping growth monitoring, timely referrals, service uptake (including immunization through health-system convergence), and the quality of early learning environments.[5]

Gwalior, a rapidly urbanizing city in Madhya Pradesh with a mix of dense urban settlements, peri-urban belts, and underserved pockets, offers a compelling context to examine front-line performance. AWWs here must navigate diverse sociocultural norms, variable literacy levels among beneficiaries, migration-linked service discontinuities, and competing caregiving demands. Ensuring that AWWs possess accurate technical knowledge (e.g., on IYCF practices, anthropometry, danger-sign recognition) and can translate it into reliable day-to-day functions (home visits, growth plotting, counselling, record-keeping, and inter-sectoral coordination) is essential to improving child growth and development outcomes.

This study "Knowledge and Functional Assessment of Anganwadi Workers under the ICDS Scheme in Gwalior City, M.P."—seeks to systematically appraise AWWs' knowledge across key ICDS domains and to evaluate functional competencies at the AWC and community levels. By identifying strengths and gaps in training, supervision, logistics, and convergence practices, the assessment aims to generate actionable insights for targeted capacity-building, supportive supervision, and service-delivery improvements. In doing so, it aligns with the broader national imperative to translate ICDS's vast coverage into consistently high-quality, outcome-oriented services for India's most vulnerable mothers and children.

## MATERIALS AND METHODS

An observational, cross-sectional design was employed to assess Anganwadi Workers' (AWWs) knowledge across ICDS domains and the functional performance of AWCs.

The study was conducted in urban ICDS project areas of Gwalior City, Madhya Pradesh, India, where Anganwadi Centres (AWCs) function under the Ministry of Women & Child Development. Data collection spanned 18 months, from 1 January 2021 to 30 June 2022.

The sampling frame comprised all functional AWCs in Gwalior City (N = 754) distributed across six administrative zones—Morar, GWL-1, GWL-2, GWL-3, GWL-4, and GWL-5. The AWC was the sampling unit and the posted AWW the respondent at each selected centre.

**Sample Size Determination**

Sample size was calculated for a single proportion using $n = (Z^2\alpha/2 \times p \times q) / L^2 \times DE$. Assumptions: p = 68.5% (efficient AWC functioning, Asha et al.), q = 31.5%, $Z\alpha/2 = 1.96$, relative precision L = 10% of p (6.85%), and design effect (DE) = 1.5. The initial estimate ($n_0$) was 176.6; after applying DE, the final sample was 264.9 ≈ 265 AWCs.

**Sampling Technique and Allocation**

Stratified random sampling with proportional allocation ensured zone-wise representativeness using official lists from the Child Development Project Officer (CDPO) office. Zone-wise selections were: Morar 56/159, GWL-1 54/153, GWL-2 36/103, GWL-3 36/103, GWL-4 37/104, GWL-5 46/132, totaling 265/754 AWCs.

**Eligibility Criteria**

Inclusion: Anganwadi centers which were functional from last 6 months

**Exclusion:** Non-functional AWCs; AWCs functional for < 6 months; AWWs declining participation.

**Study Instrument**

Data were collected using a pre-designed, pre-tested, semi-structured, interview-based questionnaire, refined after pilot testing. Sections covered general AWC/AWW information; facility availability (infrastructure, logistics, records); AWW knowledge of ICDS components (supplementary nutrition, non-formal pre-school education, nutrition & health education, immunization, health check-up, referral); operational challenges and suggestions; growth monitoring and counselling; immunization planning and convergence; and nutrition & health education activities.

**Data Collection Procedure**

Zone-wise lists of functional AWCs were obtained from the CDPO office. Selected AWWs were contacted in advance, appointments scheduled, the study purpose explained, and written informed consent obtained. On-site interviews were conducted ensuring privacy and confidentiality. Data were entered daily into Microsoft Excel with routine completeness and consistency checks.

**Data Management and Statistical Analysis**

Cleaned datasets were analysed in SPSS version 23.0. Descriptive statistics (frequency, percentage, mean, standard deviation) summarized AWC characteristics, AWW knowledge, and functional indicators. Chi-square tests examined associations between categorical variables (e.g., knowledge levels and service-delivery functions). A two-sided $p < 0.05$ was considered statistically significant. Results are presented narratively and, where appropriate, with tables, bar charts, and pie charts.

**Quality Assurance & Ethical Considerations**

Quality was ensured through tool pre-testing with minor revisions, standardized interviewer briefing, and daily verification of entries to minimize errors.

Ethical approval was obtained from the Institutional Ethics Committee, Gajra Raja Medical College, Gwalior (M.P.). Administrative permission was secured from the CDPO office. The study involved no interventions or invasive procedures. Participation was voluntary with the right to withdraw at any time, and confidentiality of respondents and programme records was strictly maintained.

## RESULTS

Among 265 AWWs assessed, most were young and mid-career: 71.3% were aged 21–40 years, and 74.3% had 1–5 years experience. Socially, General 40.3%, OBC 37.0%, and SC/ST 22.7%; 98.9% were Hindu and 90.9% married. Literacy was 98.1%; 82.3% had graduate/postgraduate education, with a small minority below minimum qualification. Coverage was typical, with 57.0% AWCs serving 400–500 population (27.9%: 500–600; 6.4%: >600). Notably, 55.1% centres lacked a helper (sahayika), potentially constraining service delivery. [Table 1]

**Table 1: Socio-demographic profile of AWWs and centre characteristics (N = 265)**

| Variable | Category | Frequency (n) | Percentage (%) |
|---|---|---|---|
| Age group (years) | 21–30 | 98 | 37.0 |
| | 31–40 | 91 | 34.3 |
| | 41–50 | 65 | 24.5 |
| | >50 | 11 | 4.2 |
| Caste | General | 107 | 40.3 |
| | Other Backward Class | 98 | 37.0 |
| | Scheduled Caste | 49 | 18.5 |
| | Scheduled Tribe | 11 | 4.2 |
| Religion | Hindu | 262 | 98.9 |
| | Christian | 1 | 0.4 |
| | Muslim | 2 | 0.8 |
| Marital status | Married | 241 | 90.9 |
| | Unmarried | 21 | 7.9 |
| | Widow | 3 | 1.1 |
| Literacy | Literate | 260 | 98.1 |
| | Illiterate | 5 | 1.9 |
| Education | Primary school | 2 | 0.8 |
| | Middle school | 2 | 0.8 |
| | High school | 12 | 4.5 |
| | Intermediate | 31 | 11.7 |
| | Graduate | 177 | 66.8 |
| | Postgraduate | 41 | 15.5 |
| Population covered by AWC | <400 | 23 | 8.7 |
| | 400–500 | 151 | 57.0 |
| | 500–600 | 74 | 27.9 |
| | >600 | 17 | 6.4 |
| Work experience (years) | <1 | 30 | 11.3 |
| | 1–5 | 197 | 74.3 |
| | >5 | 38 | 14.3 |
| Helper (sahayika) present | Yes | 119 | 44.9 |
| | No | 146 | 55.1 |

Overall infrastructure was mixed. Space was frequently inadequate (76.2%), though over half of centres operated from own buildings (56.6%) and most had two rooms (89.4%). Boundary protection was partial: all-around fencing (43.4%), parallel (39.2%), and absent (17.4%). While separate cooking space was common (92.8%) and adequate seating was available in 71.3%, ventilation was inadequate in 79.6% of AWCs. Basic utilities showed gaps: electricity was absent in 73.2%, but telephone/mobile connectivity was near-universal (95.1%); toilets (78.1%) and drinking water (82.3%) were usually available, though hygiene/sanitation was rated good in only 21.1%. Indoor play equipment was available in 38.9%, and medicines were available in just 15.5% of centres.

Service enablers and tools were variably present. Supplementary nutrition (SN) was provided by 95.1% of AWCs, with growth charts available in 76.2%. For growth monitoring, electronic scales (43.4%) were most common, followed by spring balance (23.0%), MUAC tapes (17.4%), and Salter scales (16.2%). Pre-school education (PSE) materials were available in 39.6% of centres; cooking vessels in 22.7%, and water-storage vessels in 42.6%. [Table 2]

**Table 2: Infrastructure, Utilities & Tools at AWCs (N = 265)**

| Parameter | Category | Frequency (n) | Percentage (%) |
|---|---|---|---|
| Space adequacy | Adequate | 63 | 23.8 |
| | Inadequate | 202 | 76.2 |
| Own building[1] | Yes | 150 | 56.6 |
| | No | 115 | 43.4 |
| Pucca construction[2] | Pucca | 133 | 50.2 |
| | Non-pucca | 132 | 49.8 |
| Rooms | 2 rooms | 237 | 89.4 |
| | 1 room | 28 | 10.6 |
| Boundary fencing[3] | Present | 219 | 82.6 |
| | Not available | 46 | 17.4 |
| Ventilation (adequate) | Yes | 54 | 20.4 |
| | No | 211 | 79.6 |
| Separate cooking space | Yes | 246 | 92.8 |
| | No | 19 | 7.2 |
| Adequate seating space | Yes | 189 | 71.3 |
| | No | 76 | 28.7 |
| Electricity | Yes | 71 | 26.8 |
| | No | 194 | 73.2 |
| Telephone/Mobile | Yes | 252 | 95.1 |
| | No | 13 | 4.9 |
| Toilet | Yes | 207 | 78.1 |
| | No | 58 | 21.9 |
| Drinking water | Available | 218 | 82.3 |
| | Not available | 47 | 17.7 |
| Hygiene & sanitation | Good | 56 | 21.1 |
| | Bad | 209 | 78.9 |
| Indoor play equipment | Available | 103 | 38.9 |
| | Not available | 162 | 61.1 |
| Medicines in stock | Yes | 41 | 15.5 |
| | No | 224 | 84.5 |
| Growth chart | Available | 202 | 76.2 |
| | Not available | 63 | 23.8 |
| Electronic weighing machine | Available | 115 | 43.4 |
| | Not available | 150 | 56.6 |
| MUAC tape | Available | 46 | 17.4 |
| | Not available | 219 | 82.6 |
| Salter scale | Available | 43 | 16.2 |
| | Not available | 222 | 83.8 |
| Spring balance | Available | 61 | 23.0 |
| | Not available | 204 | 77.0 |
| PSE materials | Available | 105 | 39.6 |
| | Not available | 160 | 60.4 |
| Cooking vessels | Available | 60 | 22.7 |
| | Not available | 205 | 77.4 |
| Water-storage vessels | Available | 113 | 42.6 |
| | Not available | 152 | 57.4 |

[1] "No" = rented + other buildings (103 + 12).
[2] "Non-pucca" = kuccha + semi-pucca (51 + 81).
[3] "Present" = all-around + parallel fencing (115 + 104).

Service coverage skewed toward maternal beneficiaries within SN: pregnant women (33.6%) and lactating women (27.5%) formed the largest shares, followed by 3–6 years (21.1%) and <3 years (17.7%). For antenatal services at AWCs, TT immunization for all pregnant women was reported by 44.2% of centres (with the remainder covering >50%), early ANC registration (≤12 weeks) for all by 40.0%, and any ANC provided to all by 21.1% (most centres covered >50% or <50%). Child health services reached all enrolled children in 25.7% of AWCs and >50% in 54.3%.

Programme processes were relatively strong: community participation (adequate) 83.4%, intersectoral coordination 82.3%, supportive supervision 83.4%, and coordination with ANMs 76.6%. However, record-keeping gaps were notable: nutrition registers (maintained) 29.0%, PSE registers 15.8%, medicine distribution 14.7%, birth/death 15.1%, contrasted with near-universal

immunization/IFA/Vit-A registers (97.0%). [Table 3]

**Table 3. Services & Processes at AWCs (N = 265)**

| Parameter | Category | Frequency (n) | Percentage (%) |
|---|---|---|---|
| Supplementary nutrition | Provided | 252 | 95.1 |
| | Not provided / Not available | 13 | 4.9 |
| TT immunization for pregnant women | All women | 117 | 44.2 |
| | Not all women | 148 | 55.8 |
| Early ANC registration (≤12 weeks) | All women | 106 | 40.0 |
| | Not all women | 159 | 60.0 |
| Any ANC provided at AWC | All women | 56 | 21.1 |
| | Not all women | 209 | 78.9 |
| Child health services coverage | All children | 68 | 25.7 |
| | Not all children | 197 | 74.3 |
| Health check-up camps reported[4] | Yes | 247 | 93.2 |
| | No response | 18 | 6.8 |
| Poster charts used (PSE) | Yes | 105 | 39.6 |
| | No | 160 | 60.4 |
| Play-way used (PSE) | Yes | 70 | 26.4 |
| | No | 195 | 73.6 |
| Role-play used (PSE) | Yes | 67 | 25.3 |
| | No | 198 | 74.7 |
| Other PSE method used | Yes | 23 | 8.7 |
| | No | 242 | 91.3 |
| Community participation | Adequate | 221 | 83.4 |
| | Inadequate | 44 | 16.6 |
| Intersectoral coordination | Adequate | 218 | 82.3 |
| | Inadequate | 47 | 17.7 |
| Supportive supervision | Adequate | 221 | 83.4 |
| | Inadequate | 44 | 16.6 |
| Coordination with ANMs | Yes | 203 | 76.6 |
| | No | 62 | 23.4 |
| Nutrition register | Maintained | 77 | 29.0 |
| | Not maintained | 188 | 71.0 |
| PSE register | Present | 42 | 15.8 |
| | Absent | 223 | 84.2 |
| Medicine distribution register | Present | 39 | 14.7 |
| | Absent | 226 | 85.3 |
| Birth & death register | Present | 40 | 15.1 |
| | Absent | 225 | 84.9 |
| Immunisation/IFA/Vit-A register | Present | 257 | 97.0 |
| | Absent | 8 | 3.0 |

[4] "Yes" aggregates centres reporting monthly, bi-monthly, or tri-monthly health check-ups.

Knowledge among AWWs is strong for routine immunisation (overall 96.2% correct; item-wise ≥71% for DPT interval, measles age, 5-year vaccine, and TT in pregnancy) and high for core SN and growth-monitoring concepts (SN 96.2% correct; growth monitoring 94.3% correct). Operationally, most know the combined "morning snack + cooked meal" modality (77%).

However, critical gaps persist in areas that drive early detection and counselling quality: fewer than one-third correctly identified that growth monitoring should start at birth (30.9%); only 38.9% were aware of MUAC colour coding; just 41% answered EBF to 6 months correctly; and only 38% knew the ORS 24-hour discard rule. On nutrition specifics, only 25.7% selected the correct child SN norm (500 kcal & 15 g protein), indicating confusion about age-appropriate calorie–protein requirements. For maternal benefits, awareness of revised norms remains suboptimal (protein norms 36.2%; monetary norms 49.4%), suggesting the need for refresher training and updated job-aids.

Actionable implication: Prioritise focussed capacity-building modules and supportive supervision on (i) newborn–infant growth monitoring from birth, (ii) MUAC use/colour interpretation, (iii) IYCF—EBF and diarrhoea counselling (ORS handling), and (iv) current SN norms for children and revised maternal benefit norms. Targeted micro-trainings, visual job-aids (growth/MUAC charts), and quick reference cards can close these high-impact knowledge gaps. [Table 4]

**Table 4. Knowledge Table of AWWs on ICDS Health Services (N = 265)**

| Domain | Parameter | Response | Frequency (n) | Percentage (%) |
|---|---|---|---|---|
| Immunisation & Prophylaxis | Overall knowledge on immunisation | Correct | 255 | 96.2 |
| | | Incorrect | 10 | 3.8 |
| | Prophylaxis against blindness (Vit A) | Correct | 139 | 52.5 |
| | | Incorrect | 126 | 47.5 |
| Growth Monitoring | General knowledge on growth monitoring | Correct | 250 | 94.3 |
| | | Incorrect | 15 | 5.7 |

| | | | | |
|---|---|---|---|---|
| Supplementary Nutrition (SN) | Knowledge on SN (general) | Correct | 255 | 96.2 |
| | | Incorrect | 10 | 3.8 |
| Food Administration Modality | Method of food administration | Cooked meal only | 51 | 19.2 |
| | | Morning snack | 10 | 3.8 |
| | | Morning snack + cooked meal | 204 | 77.0 |
| Child SN Norms | Calorie–protein per child | 200 kcal & 5 g protein | 53 | 20.0 |
| | | 300 kcal & 10 g protein | 76 | 28.7 |
| | | 500 kcal & 15 g protein | 68 | 25.7 |
| | | 600 kcal & 20 g protein | 68 | 25.7 |
| IYCF / NHE | Exclusive breastfeeding up to 6 months | Correct | 108 | 41.0 |
| | | Incorrect | 157 | 59.0 |
| | Diet during diarrhoea | Liquid & nutritious diet | 180 | 68.0 |
| | | Other response | 85 | 32.0 |
| | ORS discard rule (within 24 hours) | Correct | 101 | 38.0 |
| | | Incorrect | 164 | 62.0 |
| Growth Monitoring Start | When to start growth monitoring | At birth | 82 | 30.9 |
| | | At 3 months | 107 | 40.4 |
| | | At 6 months | 76 | 28.7 |
| Growth Chart Colour Use | Use colour code for growth monitoring | Yes | 175 | 66.0 |
| | | No | 90 | 34.0 |
| MUAC Awareness | Aware of MUAC tape colour coding | Yes | 103 | 38.9 |
| | | No | 162 | 61.1 |
| Immunisation Specifics | DPT: gap between successive doses | Correct | 217 | 81.9 |
| | | Incorrect | 48 | 18.1 |
| | Measles vaccine: correct age | Correct | 229 | 86.4 |
| | | Incorrect | 36 | 13.6 |
| | Vaccine due at 5 years | Correct | 189 | 71.0 |
| | | Incorrect | 76 | 29.0 |
| | Tetanus toxoid doses in pregnancy | Correct | 215 | 81.1 |
| | | Incorrect | 50 | 18.9 |
| Maternal Benefit Norms | Protein norms for PW/LW | Revised norms known | 96 | 36.2 |
| | | Pre-revised norms | 169 | 63.8 |
| | Monetary norms for PW/LW | Revised norms known | 131 | 49.4 |
| | | Pre-revised norms | 134 | 50.6 |

[1] Assumed correct child SN norm: 500 kcal & 15 g protein; choices above/below this are treated as incorrect for this item.

## DISCUSSION

This cross-sectional assessment of 265 AWWs and their AWCs in Gwalior highlights a workforce that is predominantly young to mid-career and relatively well-educated, operating within facilities that meet several basic norms yet face persistent infrastructural and systems gaps.[6]

Nearly 71% of AWWs were 21–40 years—an age band associated with faster skill acquisition and effective field performance—while only 4% were >50 years, echoing age profiles reported elsewhere: Wilson et al. noted 71.4% in 18–44 years,[7] similar distributions were seen by Sujata et al., Agarwal et al., and Khan et al.[8-10] Consistent with prior studies, most workers were Hindu.[8,9,11,12] Educational attainment in our cohort was high (graduates/postgraduates ≈82%), comparable to or exceeding reports from Gujarat, Delhi and Uttarakhand,[8,10,13–16] suggesting a favourable foundation for advanced, protocol-driven tasks.

Facility readiness showed a mixed picture. Although over half of centres operated from own buildings (56.6%), three-quarters reported inadequate space and ~80% inadequate ventilation. Electricity was absent in 73%, paralleling deficits reported by Reddy and Kotresh et al. (29–36% with electricity) and contrasting with Punjab (≈49% availability).[17,18] Toilet (78%) and drinking-water (82%) access were comparatively better and broadly aligned with or superior to prior reports from Uttarakhand and elsewhere.[13,19] However, hygiene/sanitation conditions were rated good in only 21%, and indoor play materials were scarce (39%), both lower than several district studies.[18,19] Medicine stocks were available in 15.5% of AWCs, mirroring shortages seen by Saxena et al. but differing from settings with stronger drug logistics.[11,20] These infrastructural lacunae plausibly constrain the quality of nutrition services, growth monitoring, and PSE.

Service enablers and tools were variably available. Separate space for cooking (93%) and growth charts (76%) were common; for growth monitoring, electronic scales (43%), spring balances (23%), Salter (16%), and MUAC tapes (17%) together indicate partial readiness, with device availability lower than some reports from Uttarakhand, Delhi, and Jhansi.[13,14,19,21] Supplementary nutrition (SN) provision was high (95%), consistent with the programme mandate, though some studies have reported less regularity.[10] Record-keeping showed sharp contrasts: immunisation/IFA/Vit-A registers were nearly universal (97%), but nutrition (29%), PSE (16%), birth/death (15%), and medicine distribution (15%) registers were poorly maintained—an operational risk for monitoring and supervision.

Programme processes were generally strong: adequate community participation (83%), intersectoral coordination (82%), supervision (83%), and ANM coordination (77%). Strong field relationships (e.g., with ANMs) can be leveraged to close service and knowledge gaps.

Knowledge domains revealed clear strengths and actionable weaknesses. Immunisation knowledge was high overall (96%), with item-level correctness for DPT spacing (82%), measles age (86%), vaccine at 5 years (71%), and TT in pregnancy (81%), consonant with or better than reports from Bihar and other settings.[23] Growth-monitoring knowledge was also high (94%), yet only 31% recognised that monitoring should start at birth; two-thirds reported using colour coding, but only 39% understood MUAC colour bands—gaps that directly affect early risk detection. On SN, most knew the correct service modality (morning snack + cooked meal), but only ~26% chose the correct child calorie-protein norm (500 kcal/15 g), indicating confusion over age-appropriate entitlements. IYCF/NHE counselling knowledge was suboptimal: 41% knew EBF to 6 months (vs. much higher figures in some studies),[6] 68% advised appropriate diet during diarrhoea; only 38% knew to discard ORS after 24 h. Awareness of revised maternal norms was limited (protein norms 36%; monetary norms 49%), implying that updates have not fully percolated to frontline practice. Similar heterogeneity in knowledge has been described across districts in Gujarat, Karnataka and the north Indian belt.[6,13–15,16,23]

Taken together, these findings suggest that supply-side readiness (space, ventilation, electricity, medicines, PSE kits) and knowledge-to-practice translation (MUAC use, growth monitoring from birth, IYCF/diarrhoea counselling, current SN norms) are the principal levers for improvement. Strengths—youthful, educated workforce; high SN and immunisation knowledge; good coordination and supervision—provide a strong platform for targeted quality improvement.

Strengths and limitations. Strengths include a city-wide, stratified sample and comprehensive assessment spanning infrastructure, services, processes and knowledge. As a cross-sectional, self-report–heavy design, social desirability and recall biases are possible; facility spot-checks were not uniformly accompanied by direct observation of practices, and causality cannot be inferred.

Programmatic implications. We recommend (i) focused micro-modules and on-site demonstrations on MUAC colour coding, newborn–infant growth monitoring from birth, EBF and diarrhoea counselling (including ORS handling), and revised SN norms for children and PW/LW; (ii) laminated job-aids and quick-reference cards at AWCs; (iii) corrective logistics for medicines, PSE materials, and weighing/MUAC tools; (iv) basic facility upgrades (ventilation, electricity) and cleanliness drives; and (v) supportive supervision that couples register audits with brief, data-informed feedback cycles. Such actions align with the literature and are likely to yield rapid, measurable gains in service quality and outcomes.

## CONCLUSION

In sum, this in-depth assessment shows an ICDS platform with reach but uneven readiness. Most Anganwadi Centres face structural deficits—inadequate indoor/outdoor space, the absence of dedicated kitchens and storage, and overall poor infrastructure—creating friction in day-to-day work. Service delivery is generally satisfactory, yet outcomes are constrained by gaps in logistics: irregular availability of growth-monitoring tools and the need to strengthen the quality and consistency of supplementary food.

On the people side, AWWs exhibit good knowledge of immunization, but weaker understanding of supplementary nutrition and exclusive breastfeeding, signaling clear priorities for refresher training and job-aids. The pain points voiced by workers—low honorarium, excessive workload, fragile supply chains, and heavy record-keeping—further dilute programme impact. To convert coverage into measurable child and maternal gains, the path forward is practical and achievable: upgrade basic infrastructure, stabilize supplies (weighing/MUAC, charts, food), streamline paperwork, and invest in targeted capacity-building—especially on SN and EBF—while addressing compensation and support to sustain frontline motivation.

Translating coverage into outcomes now hinges on following recommendations:

- Fix basics: Ensure each AWC has adequate space, ventilation, toilets, safe drinking water, electricity, a separate kitchen, and storage.
- Secure supplies: Maintain steady stocks of SN, weighing/MUAC tools, growth charts, PSE kits, basic medicines, and cooking/water vessels with simple stock tracking.
- Train & supervise: Provide regular on-the-job micro-trainings (IYCF/EBF, ORS, MUAC, growth monitoring from birth, revised SN norms) backed by supportive, checklist-based supervision.
- Motivate staff: Add performance-based incentives, fill helper vacancies, and streamline paperwork (simplified/digital registers) to reduce workload and protect counselling/home-visit time.

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