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Assessment of ICDS Service Delivery and Infrastructure in Drought-Affected Regions of Marathwada

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Abstract:

The Integrated Child Development Services (ICDS) is India's flagship programme for improving child nutrition, health, and early childhood development through Anganwadi Centres. In drought-prone regions, where food insecurity and vulnerability are heightened, ICDS plays a critical protective role. However, environmental stress such as drought can disrupt service delivery and limit programme effectiveness. The present study assesses the infrastructure, service utilisation, and operational challenges of ICDS in drought-affected regions of Marathwada, Maharashtra.

A cross-sectional institutional assessment was conducted across 10 Anganwadi Centres, covering 412 enrolled children and 10 Anganwadi Workers. Data were collected using facility checklists, service utilisation records, and structured interviews. Descriptive statistics and gap analysis were used to evaluate infrastructure adequacy and service delivery performance.

The findings revealed considerable infrastructural deficiencies, with only 60% of centres operating in permanent buildings and just 20% having year-round water availability. Service utilisation gaps were substantial, particularly in health check-ups (81.1%) and growth monitoring (35.0%), while supplementary nutrition and preschool education also showed notable gaps. Anganwadi Workers reported major operational challenges, including water scarcity (90%), delays in Take-Home Ration supply (80%), child migration (70%), and increased administrative workload.

The study concludes that while ICDS remains a crucial safety net in drought-prone areas, its effectiveness is significantly constrained by infrastructural limitations and operational disruptions during drought conditions. Strengthening infrastructure, ensuring uninterrupted supply chains, and enhancing system resilience are essential to improve service delivery and protect child health in environmentally vulnerable regions.

Keywords: *Integrated Child Development Services (ICDS); Anganwadi Centres; Service Delivery; Infrastructure; Drought; Child Nutrition; Public Health Systems; Marathwada*

1. Introduction:

Early childhood represents a critical phase in human development, during which adequate nutrition, health care, and cognitive stimulation are essential for long-term physical and mental well-

being. In low- and middle-income countries, child malnutrition remains a persistent public health challenge, contributing significantly to morbidity, mortality, and impaired developmental outcomes (Black et al., 2013). Addressing these challenges requires comprehensive and integrated interventions that target both nutritional and socio-environmental determinants of child health.

In India, the Integrated Child Development Services (ICDS) programme serves as the primary institutional mechanism for delivering early childhood care and nutrition services. Launched in 1975, ICDS is one of the largest community-based outreach programmes globally, providing a package of six essential services, including supplementary nutrition, preschool education, immunization support, health check-ups, referral services, and nutrition and health education. These services are delivered through Anganwadi Centres (AWCs), which function as the grassroots-level platform for child and maternal welfare. Over the years, ICDS has played a significant role in improving child survival and nutritional outcomes, particularly among vulnerable populations (Government of India, 2020).

Despite its extensive coverage, the effectiveness of ICDS is often influenced by contextual factors such as infrastructure, resource availability, workforce capacity, and environmental conditions. In drought-prone regions, these challenges are further intensified. Drought is a slow-onset environmental stressor that affects water availability, agricultural productivity, household income, and food security, thereby increasing the demand for nutrition and health services (Belesova et al., 2019). At the same time, drought disrupts the operational capacity of service delivery systems, including ICDS, through water scarcity, supply chain interruptions, and increased workload on frontline workers. The Marathwada region of Maharashtra is among the most drought-affected areas in India, characterized by recurrent rainfall deficits, low groundwater recharge, and limited irrigation infrastructure. Districts such as Aurangabad, Jalna, Beed, and Osmanabad frequently experience severe drought conditions, leading to agrarian distress, migration, and heightened vulnerability among rural populations. In such settings, Anganwadi Centres play a crucial role in ensuring access to supplementary nutrition and basic health services. However, their functioning is often constrained by inadequate infrastructure, irregular supply of food and materials, and logistical challenges during drought periods.

Existing studies on ICDS have primarily focused on its impact on nutritional outcomes under normal conditions, with relatively limited attention to its performance under environmental stress. Evidence suggests that issues such as poor infrastructure, irregular service delivery, and overburdened Anganwadi Workers continue to affect programme efficiency (NITI Aayog, 2023). In drought-affected contexts, these limitations may be further exacerbated, leading to significant gaps in service utilisation and reduced programme effectiveness precisely when it is most needed.

Furthermore, the interaction between environmental stress and institutional response remains insufficiently explored at the micro level. While macro-level reports highlight general challenges in

ICDS implementation, there is a lack of empirical studies examining how drought conditions specifically affect infrastructure, service delivery, and frontline workers in localized settings such as Marathwada. Understanding these dynamics is essential for designing resilient and context-specific interventions.

In this context, the present study aims to assess the infrastructure, service utilisation, and operational challenges of ICDS in drought-affected regions of Marathwada. By analysing facility-level conditions, service gaps, and constraints faced by Anganwadi Workers, the study seeks to provide evidence on the functioning of ICDS under drought stress. The findings are expected to contribute to strengthening policy frameworks and improving the resilience of child nutrition programmes in environmentally vulnerable regions.

2. Literature Review:

The effectiveness of early childhood nutrition programmes in low- and middle-income countries depends not only on policy design but also on the strength of service delivery systems at the grassroots level. In India, the Integrated Child Development Services (ICDS) programme represents the cornerstone of child nutrition and early childhood care, aiming to address malnutrition through a package of integrated services delivered via Anganwadi Centres. Over the decades, ICDS has expanded significantly in coverage and has contributed to improvements in child health indicators, particularly in terms of immunization, growth monitoring, and access to supplementary nutrition (Government of India, 2020).

However, several studies have highlighted persistent gaps in ICDS infrastructure and service delivery. Evaluations conducted across different states in India have reported inadequate physical infrastructure, irregular availability of supplementary nutrition, and limited access to clean water and sanitation facilities at Anganwadi Centres. These infrastructural deficiencies directly affect the quality and consistency of service delivery, particularly in rural and resource-constrained settings (NITI Aayog, 2023). In addition, Anganwadi Workers often face challenges related to excessive workload, insufficient training, and administrative responsibilities, which reduce the time available for core service provision.

Service utilisation is another critical dimension influencing the effectiveness of ICDS. While enrolment rates are generally high, actual utilisation of services such as growth monitoring, health check-ups, and preschool education often remains suboptimal. Studies have shown that irregular attendance of children, lack of awareness among caregivers, and migration contribute to service gaps. Furthermore, coordination between ICDS and the health system, particularly in relation to immunization and health check-ups, is often weak, leading to fragmented service delivery (Avula et al., 2017).

Environmental stressors such as drought further complicate the functioning of ICDS. Drought

is known to disrupt food systems, water availability, and household livelihoods, thereby increasing the demand for nutrition and health services. At the same time, it places additional strain on service delivery mechanisms. Evidence from drought-prone regions indicates that water scarcity, supply chain disruptions, and increased migration negatively affect the functioning of Anganwadi Centres (Belesova et al., 2019). For instance, lack of water directly impacts the preparation of supplementary nutrition and maintenance of hygiene at centres, while irregular supply of take-home rations reduces the reliability of nutrition support.

In drought-affected contexts, the role of ICDS becomes even more critical as a safety net programme. However, studies suggest that its capacity to respond effectively under such conditions is limited by structural and operational constraints. Supply delays, reduced dietary diversity in supplementary nutrition, and increased workload among Anganwadi Workers are commonly reported issues. Moreover, the migration of families during drought periods disrupts continuity of service utilisation, particularly for children who depend on Anganwadi Centres for regular nutrition and preschool education.

Socio-economic factors further influence the performance and reach of ICDS services. Children from economically disadvantaged households, particularly those belonging to Scheduled Castes and Scheduled Tribes, are more dependent on public nutrition programmes and are also more vulnerable to service disruptions. Inequities in access to services, combined with environmental stress, can therefore exacerbate existing disparities in child nutrition outcomes (Black et al., 2013).

Despite extensive research on ICDS, there remains a significant gap in micro-level studies that examine its functioning under environmental stress conditions such as drought. Most available studies focus either on national or state-level performance indicators or on specific aspects such as nutrition outcomes, without integrating infrastructure, service delivery, and operational challenges in a single framework. In regions like Marathwada, where drought is a recurrent phenomenon, there is a need for localized evidence that captures the interaction between environmental stress and institutional response.

The present study addresses this gap by providing a comprehensive assessment of ICDS infrastructure, service utilisation, and operational challenges in drought-affected regions of Marathwada. By focusing on facility-level conditions and frontline worker experiences, the study contributes to a better understanding of how public nutrition programmes function under climatic stress and identifies areas for strengthening system resilience.

3. Results:

3.1 Infrastructure Status of Anganwadi Centres:

The assessment of 10 Anganwadi Centres (AWCs) revealed notable gaps in infrastructure, particularly in relation to water availability, sanitation, and essential facilities. While a majority of

centres (60.0%) operated from permanent buildings, only half had adequate indoor space as per recommended norms. Access to water and sanitation facilities was limited, with only 20.0% of centres reporting year-round availability of drinking water and 40.0% having toilets with running water. These deficiencies are critical in drought-affected regions, where water scarcity directly impacts hygiene, food preparation, and overall service delivery.

Table 3.1: Infrastructure Status of Anganwadi Centres (n = 10)

Infrastructure Component	n	%
Permanent Building	6	60.0
Indoor Space ≥600 sq. ft	5	50.0
Toilet with Running Water	4	40.0
Drinking Water Available Year-Round	2	20.0
Functional Weighing Scale	7	70.0
Stadiometer/Infantometer	5	50.0
MUAC Tape Available	8	80.0
Medicine Kit Replenished	3	30.0
Preschool Kit/Toys Available	5	50.0
Registers Updated	6	60.0

Equipment availability showed mixed results. While MUAC tapes (80.0%) and weighing scales (70.0%) were relatively well available, only 50.0% of centres had height measurement equipment, and just 30.0% had adequately replenished medicine kits. These findings indicate partial preparedness of AWCs to deliver comprehensive services.

3.2 ICDS Service Utilisation:

The analysis of service utilisation among 412 enrolled children revealed significant gaps across multiple ICDS services. Although supplementary nutrition reached 70.9% of enrolled children, nearly one-third did not receive consistent benefits. Growth monitoring services were utilised by 65.0% of children, leaving a substantial gap of 35.0%. The most critical gap was observed in health check-ups, where only 18.9% of children received services, resulting in an 81.1% gap. Immunization coverage was comparatively higher at 82.8%, although a gap of 17.2% persisted. Among children aged 3–6 years, preschool education services were utilised by 54.3%, indicating that nearly half of the eligible children were not regularly attending early childhood education activities.

Table 3.2: ICDS Service Utilisation and Gaps (n = 412)

Service	Enrolled	Utilised	Gap (%)
Supplementary Nutrition	412	292	29.1
Growth Monitoring	412	268	35.0
Health Check-Up	412	78	81.1
Immunization	412	341	17.2
Preschool Education (3–6 yrs)	219	119	45.7

The findings highlight that while basic services such as immunization and supplementary nutrition show moderate coverage, preventive and monitoring services such as health check-ups and growth tracking are significantly underutilised.

3.3 Operational Challenges Faced by Anganwadi Workers:

Anganwadi Workers (AWWs) reported several operational challenges that affected the delivery of ICDS services in drought conditions. The most frequently reported issue was drinking water shortage, affecting 90.0% of centres. This was followed by delays in the supply of Take-Home Rations (80.0%) and unavailability of vegetables for meal preparation (80.0%), both of which directly impact the quality and consistency of nutrition services.

Migration of children was reported by 70.0% of workers as a major barrier, leading to irregular attendance and disruption of services. Lack of cooking fuel (60.0%) further constrained the preparation of hot cooked meals. Additionally, 50.0% of workers reported excessive administrative duties, limiting their capacity to focus on core ICDS responsibilities.

Table 3.3: Operational Challenges Reported by Anganwadi Workers (n = 10)

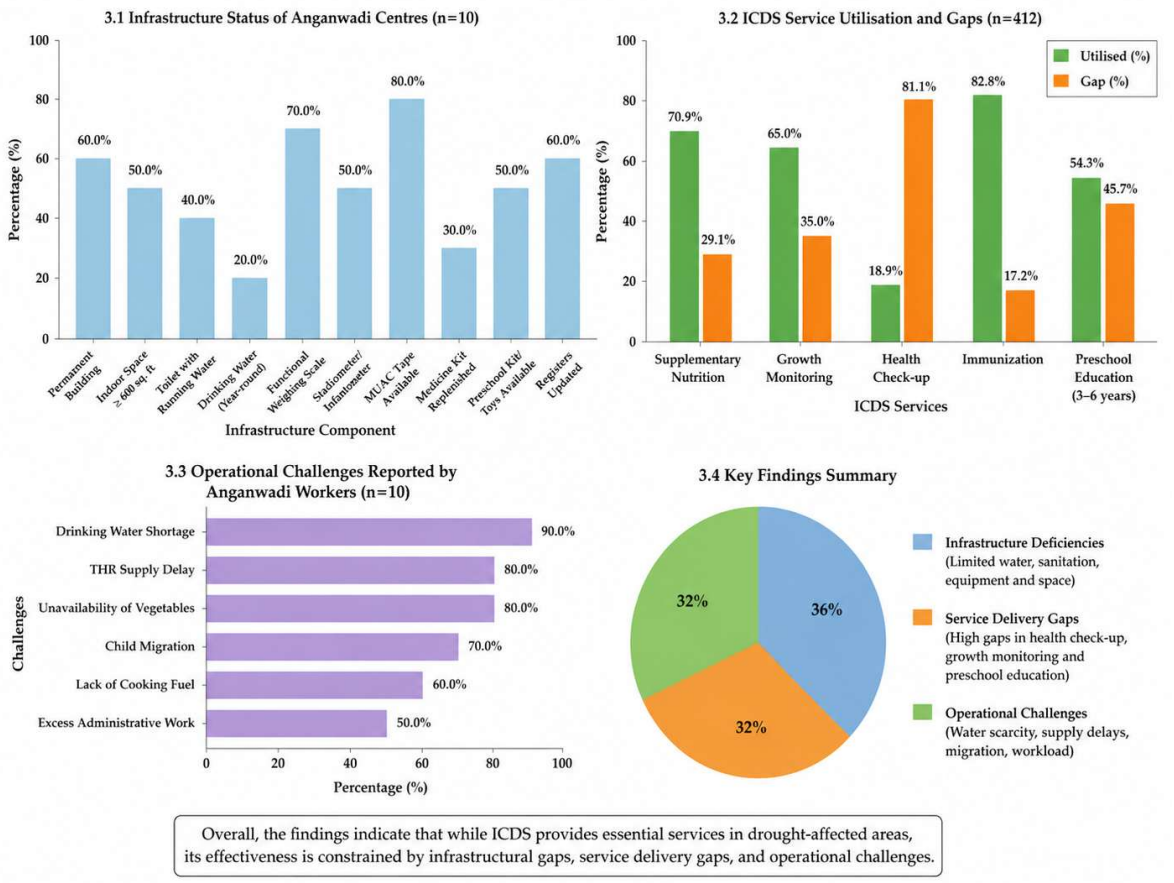
Challenge	n	%
Drinking Water Shortage	9	90.0
THR Supply Delay	8	80.0
Unavailability of Vegetables	8	80.0
Child Migration	7	70.0
Lack of Cooking Fuel	6	60.0
Excess Administrative Work	5	50.0

These findings indicate that environmental and systemic constraints significantly hinder the

effective functioning of Anganwadi Centres.

3.4 Summary of Key Findings:

The results demonstrate that ICDS functioning in drought-affected regions is constrained by a combination of infrastructural deficiencies, service delivery gaps, and operational challenges. Limited access to water, inadequate infrastructure, and supply disruptions directly affect the quality and reach of services. At the same time, migration and workforce-related challenges further weaken service utilisation. Overall, the findings suggest that while ICDS remains a critical support system, its effectiveness is significantly reduced under drought conditions.



4. Discussion:

The present study provides important insights into the functioning of the Integrated Child Development Services (ICDS) in drought-affected regions of Marathwada, highlighting significant gaps in infrastructure, service delivery, and operational capacity. The findings indicate that although ICDS serves as a critical safety net for child nutrition and early childhood care, its effectiveness is substantially constrained under conditions of environmental stress.

The assessment of Anganwadi Centre infrastructure revealed considerable deficiencies, particularly in water availability, sanitation, and essential facilities. Only a small proportion of centres had access to year-round drinking water, which is a fundamental requirement for maintaining hygiene

and preparing supplementary nutrition. These findings are consistent with national-level evaluations that have reported inadequate infrastructure and basic amenities in ICDS centres, especially in rural and resource-constrained areas (NITI Aayog, 2023). In drought-prone regions, water scarcity further aggravates these challenges, directly affecting the operational capacity of Anganwadi Centres.

Service utilisation analysis demonstrated substantial gaps across key ICDS services, with the most pronounced deficiency observed in health check-ups. Despite high enrolment, a large proportion of children did not receive regular health services, indicating weak convergence between ICDS and the public health system. Similar findings have been reported in earlier studies, which highlight that while ICDS has achieved wide coverage, actual utilisation of services remains inconsistent due to logistical constraints, irregular service delivery, and limited awareness among beneficiaries (Avula et al., 2017). The relatively better performance of immunization services in the present study suggests that programmes with stronger institutional integration and external support tend to achieve higher coverage.

Growth monitoring and preschool education services also showed considerable gaps, reflecting limitations in routine service delivery and community engagement. Growth monitoring is a critical component of early detection of malnutrition, and gaps in this service can delay identification and management of at-risk children. The observed deficiencies may be attributed to inadequate equipment, workforce constraints, and competing administrative responsibilities of Anganwadi Workers.

The study further highlights the significant impact of drought on ICDS operations. Environmental stressors such as water scarcity, disruption of food supply chains, and reduced availability of fresh food items directly affect the quality and continuity of supplementary nutrition. Anganwadi Workers reported delays in the supply of Take-Home Rations and lack of vegetables, which compromise the nutritional adequacy of meals provided to children. These findings align with existing evidence that drought conditions disrupt food systems and public service delivery mechanisms, thereby weakening institutional responses to malnutrition (Belesova et al., 2019).

Migration emerged as another critical factor affecting service utilisation. High levels of seasonal migration in drought-affected areas lead to irregular attendance at Anganwadi Centres and discontinuity in service delivery. Children from migrant households are particularly vulnerable, as they often miss out on supplementary nutrition, preschool education, and health services. Previous studies have similarly identified migration as a major barrier to effective implementation of ICDS and other social welfare programmes (Black et al., 2013).

Operational challenges faced by Anganwadi Workers further compound these issues. The study found that frontline workers are burdened with multiple responsibilities, including administrative tasks, which limit their ability to focus on core service delivery. Inadequate infrastructure, lack of resources, and increased workload during drought conditions reduce their efficiency and motivation.

These findings are consistent with broader evaluations of ICDS, which highlight workforce constraints as a key bottleneck in programme implementation (Government of India, 2020).

The interplay between environmental stress and institutional limitations observed in this study underscores the need for a more resilient and adaptive ICDS framework. Current programme design does not adequately account for the additional challenges posed by drought, resulting in reduced effectiveness precisely when the demand for services is highest. Strengthening infrastructure, ensuring uninterrupted supply chains, and enhancing coordination between ICDS and the health system are essential to improve service delivery in such contexts.

From a policy perspective, the findings suggest that ICDS must be strengthened as a climate-sensitive programme capable of responding to environmental shocks. This includes improving water and sanitation facilities at Anganwadi Centres, ensuring timely provision of nutrition supplies, and reducing administrative burden on frontline workers. Additionally, targeted strategies are required to reach migrant populations and socially disadvantaged groups who are disproportionately affected by service disruptions.

Despite its contributions, the study has certain limitations. The relatively small sample of Anganwadi Centres may limit the generalisability of findings. The cross-sectional design does not capture temporal variations in service delivery, and reliance on administrative records may introduce reporting bias. Nevertheless, the study provides valuable micro-level evidence on the functioning of ICDS under drought conditions, addressing an important gap in the existing literature.

In conclusion, the study demonstrates that while ICDS remains a vital institutional mechanism for addressing child nutrition, its performance in drought-affected regions is significantly constrained by infrastructural deficiencies, service delivery gaps, and operational challenges. Addressing these issues requires a comprehensive approach that integrates environmental resilience with programme strengthening to ensure effective delivery of child nutrition and health services in vulnerable settings.

5. Conclusion:

The present study highlights critical gaps in the infrastructure and service delivery of the Integrated Child Development Services (ICDS) in drought-affected regions of Marathwada. While ICDS remains a vital institutional mechanism for addressing child nutrition and early childhood development, its effectiveness is significantly constrained under conditions of environmental stress.

The findings reveal that infrastructural deficiencies, particularly in water availability, sanitation, and essential equipment, limit the functional capacity of Anganwadi Centres. In drought-prone settings, where water scarcity is acute, these limitations directly affect the provision of supplementary nutrition, hygiene, and overall service quality. At the same time, substantial gaps in service utilisation, especially in health check-ups and growth monitoring, indicate weak implementation of core programme components.

Operational challenges faced by Anganwadi Workers, including supply chain disruptions, lack of cooking resources, migration of beneficiaries, and increased administrative workload, further weaken service delivery. These constraints are intensified during drought conditions, when the demand for nutrition and health services is highest. As a result, the programme's ability to function as an effective safety net is reduced, leaving vulnerable children at increased risk.

The study also underscores the broader interaction between environmental stress and institutional performance. Drought not only increases nutritional vulnerability at the household level but also disrupts the very systems designed to mitigate these risks. This dual impact creates a gap between need and service provision, thereby limiting the overall effectiveness of public health interventions.

In conclusion, while ICDS continues to play a crucial role in supporting child nutrition in rural India, its current structure and delivery mechanisms are not fully equipped to withstand the pressures of recurrent drought. Strengthening infrastructure, ensuring continuity of supplies, reducing administrative burdens on frontline workers, and developing drought-responsive strategies are essential to enhance programme resilience. Addressing these gaps is critical for improving service delivery and ensuring that vulnerable populations receive adequate support during environmental crises.

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