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Women, Agriculture, and Health: Exploring the Reproductive Health Problems of Laborers in the Era of the Green Revolution in Odisha

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Abstract

This study examines the reproductive health challenges faced by women agricultural labourers in Odisha within the broader socio-economic changes brought by the Green Revolution. Using caste-based and intersectional analysis, it highlights how Scheduled Caste (SC) and Scheduled Tribe (ST) women bear the brunt of agrarian labour while lacking access to land, education, healthcare, and government support schemes. The research is grounded in field data collected from 100 respondents across different caste groups and investigates patterns in occupational exposure, pregnancy outcomes, healthcare access, and state support mechanisms. Findings reveal high incidences of back pain, fatigue, miscarriage, and teenage pregnancy, particularly among marginalised communities. Notably, over 74% of women continued working during pregnancy, often in physically taxing and chemically intensive environments. Although most respondents received basic healthcare like medicines and vaccinations, access to financial and institutional support remained uneven and skewed along caste lines. The study argues for a policy paradigm that recognises reproductive health as a structural issue shaped by intersecting inequalities in caste, class, and gender. It advocates for comprehensive reforms in rural labour rights, maternal healthcare delivery, and agricultural support systems to ensure reproductive justice for women labourers.

Keywords: gendered labour, caste, inequality, accessibility, Hirakud Command Area, vulnerabilities

Introduction

The Green Revolution, launched in India during the 1960s, brought significant agricultural transformations through the introduction of high-yielding varieties (HYVs), chemical fertilizers, and mechanized irrigation (Hazell, 2009). While it contributed to national food security and rural

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economic growth, its socio-economic and health impacts were deeply uneven. Scholars have noted that the benefits of the Green Revolution were largely skewed toward landowning male farmers, while marginalized groups—particularly women agricultural labourers—often bore its hidden costs (Patel, 2013; Agarwal, 1997). In states like Odisha, where a substantial portion of the rural female population is engaged in agricultural labour, these impacts have been especially acute.

Women in Odisha's agrarian economy are frequently employed in labour-intensive tasks such as weeding, transplanting, and pesticide application—roles that carry high physical and chemical exposures (Dhal, 2023; Cycon, 2013). Despite their centrality to agricultural productivity, these women often remain excluded from land rights, decision-making, and institutional health protections (Agarwal, 1989). Emerging studies suggest that exposure to agrochemicals, long working hours, and poor nutrition contribute to serious reproductive health problems, including menstrual irregularities, miscarriages, hormonal imbalances, and infertility (Khan et al., 2025; Brainerd & Menon, 2014). However, these issues are underrepresented in mainstream policy discourse, reflecting a broader neglect of rural women's health and bodily autonomy in agrarian contexts.

This research seeks to explore the reproductive health challenges faced by women agricultural labourerswithin Hirakud Command Area (HCA) inOdisha during and after the Green Revolution. By focusing on a region often overlooked in Green Revolution narratives, the study aims to examine the gendered dimensions of agricultural modernization and their health consequences. It also interrogates the structural inequalities—caste, class, and gender—that intersect to produce unique health vulnerabilities for rural women. In doing so, the research not only contributes to filling a critical knowledge gap but also calls for gender-sensitive reforms in agricultural and health policy. Understanding the lived experiences of these labouring women is essential to addressing the invisible burdens they carry in the name of national development.

Literature Review

Green Revolution and Agrarian Transformation in India

The Green Revolution, launched in India during the 1960s, was a major agricultural initiative that aimed to increase food production through the adoption of modern technologies. It involved the use of high-yielding varieties (HYVs) of seeds, chemical fertilizers, pesticides, and expanded irrigation infrastructure (Hazell, 2009). Initially implemented in regions such as Punjab, Haryana, and western Uttar Pradesh, the strategy led to dramatic increases in the production of rice and wheat. India, once dependent on food imports, achieved self-sufficiency in grain production within a decade (Conway, 1998).

However, the Green Revolution's benefits were not uniformly distributed. Wealthier, land-owning farmers—particularly in already-irrigated regions—were best positioned to take advantage of the new inputs, while smallholders, tenants, and landless labourers often struggled to access the necessary capital or technology (Patel, 2013). This disparity not only widened economic inequality but also created social tensions, as agricultural mechanization reduced demand for manual labour in some regions, leading to job displacement for the rural poor (Hazell & Ramasamy, 1991).

Odisha presents a unique case in this narrative. As a relatively underdeveloped eastern state, Odisha was not among the initial beneficiaries of the Green Revolution. The state's fragmented landholdings, limited irrigation coverage, and tribal-dominated population delayed the adoption of high-input technologies (Dhal, 2023). When modern methods eventually did penetrate rural Odisha, they often increased workloads and ecological vulnerabilities without substantially improving rural livelihoods, particularly for women agricultural labourers. Unlike in Punjab or Haryana, where input subsidies were relatively accessible, Odisha's marginalized communities were left to navigate the consequences of an uneven agrarian transformation with little institutional support.

Women's Labor in Post-Green Revolution Agriculture

The feminization of agriculture in India has become increasingly visible, particularly in eastern states such as Odisha, where structural and demographic shifts have reshaped rural labour

dynamics. Factors such as male out-migration, agrarian distress, and the fragmentation of landholdings have led to a growing reliance on women as primary agricultural workers (Agarwal, 1989; Mies, 1980). Despite their expanded presence in the fields, women's roles in agriculture are largely characterized by informal, low-wage, and physically demanding labour. Tasks such as weeding, transplanting, harvesting, and pesticide application are commonly assigned to women and often performed without adequate training, protective equipment, or rest (De, 2015; Rao, 2006).

Even as women form the backbone of agrarian labour, their work remains systematically undervalued. They frequently lack ownership over land and productive assets, which restricts their access to formal credit, agricultural extension services, and input subsidies (Agarwal, 1997; FAO, 2011). Moreover, the introduction of Green Revolution technologies often displaced women from traditional knowledge systems and agroecological roles, relegating them to more hazardous and mechanized tasks while decision-making remained in male hands (Patel, 2013; Shiva, 1991).

In Odisha, the situation is particularly acute due to intersecting factors of poverty, caste, and tribal marginalization. Women's agricultural contributions are often subsumed under family labour, leading to their exclusion from official statistics and policy planning (Kabeer & Natali, 2013). Additionally, wage differentials between male and female labourers persist, reinforcing the structural subordination of women in rural economies (Deshpande, 2011). As such, while women have become indispensable to post-Green Revolution agriculture, their roles remain precarious, under-recognized, and linked to heightened physical and reproductive health vulnerabilities.

Reproductive Health Risks among Women Agricultural Laborers

The increased use of chemical-intensive agricultural methods, a hallmark of the Green Revolution, has had serious health implications for women labourers in rural India. Multiple studies have established a strong correlation between chronic exposure to pesticides and a range of reproductive health issues, including menstrual disorders, spontaneous abortions, infertility, hormonal imbalances, and premature menopause (Khan et al., 2025; Brainerd & Menon, 2014). These conditions are frequently observed among women involved in tasks such as pesticide

mixing, spraying, and handling of chemically treated crops, roles disproportionately filled by women due to gendered labour divisions in agriculture (FAO, 2011; Cycon, 2013).

In Odisha, these reproductive health risks are intensified by inadequate safety measures and systemic neglect. Most women labourers operate without access to personal protective equipment, basic training, or information about the long-term effects of chemical exposure (John & Babu, 2021). Cycon (2013) highlights that despite being frontline agricultural workers, women are rarely the focus of occupational health programs, and their experiences of bodily distress are often dismissed or misattributed within both medical and community settings.

Additionally, structural barriers compound these risks. Health infrastructure in rural Odisha remains under-resourced and culturally inaccessible, particularly for tribal and low-caste women. Social stigma surrounding reproductive disorders often deters women from seeking timely medical attention, leading to chronic neglect of treatable conditions (Shiva, 1991; Patel, 2013). Furthermore, the absence of gender-disaggregated data and surveillance systems has contributed to the invisibility of these issues in policy discourse (Rao, 2006). As such, reproductive health risks among women agricultural labourers are not only the result of direct exposure but also of a broader political and institutional failure to integrate gender into occupational health and agricultural policy frameworks.

Intersectionality: Gender, Caste, and Class in Health Disparities

Understanding reproductive health challenges among women agricultural labourers in India—particularly in Odisha—requires an intersectional framework that considers the overlapping systems of caste, class, gender, and geographic marginality. Women from Scheduled Castes (SC), Scheduled Tribes (ST), and Other Backward Classes (OBC) are often at the lowest rungs of rural social hierarchies and face systemic exclusion from land ownership, education, healthcare, and dignified employment (Mies, 1980; Kabeer, 2000). In Odisha's agrarian context, these intersecting inequalities intensify the physical, economic, and emotional burdens placed on women engaged in agricultural labour.

Not only are these women paid less than their male counterparts, but they are also relegated to the most hazardous and informal tasks in the agricultural value chain, including pesticide

spraying and weeding—without protective gear or health education (Agarwal, 1997; Khan et al., 2025). Health risks from such exposure are compounded by poor nutrition, limited access to antenatal care, and gender norms that devalue women's bodily autonomy (Sen &Ostlin, 2008). Cultural stigma around menstruation, infertility, and miscarriage discourages women from seeking reproductive healthcare, even when symptoms are severe (Cycon, 2013).Migration further magnifies these issues. Many women from rural Odisha migrate seasonally for work in agricultural belts where health services are inaccessible or unaffordable (Podh, 2024; Patel, 2013). As temporary labourers, they often fall outside formal welfare schemes and are denied basic health entitlements. Scholars argue that the convergence of gendered labour, caste discrimination, and spatial dislocation creates a "triple jeopardy" for rural women, who remain invisible in both agricultural and public health policymaking (Desai & Banerji, 2008; John & Babu, 2021).

Policy Gaps and the Need for Gender-Sensitive Reforms

Although the Green Revolution is widely celebrated as a milestone in technological and agricultural development, it largely overlooked the differentiated impacts on men and women, particularly in rural contexts. Policies implemented during and after the Green Revolution rarely acknowledged or addressed the specific gendered consequences of intensified agricultural practices. In Odisha, existing health and agricultural programs have often marginalized reproductive health considerations within rural labour frameworks, thereby neglecting the interconnectedness of women's health, labour conditions, and agricultural productivity (Agarwal, 1997; Mukherjee, 2019).Recent studies emphasize the urgent need for gender-sensitive reforms that foreground the lived realities of rural women farmers and labourers. These reforms should include not only the integration of reproductive and occupational health services but also a more robust enforcement of workplace safety standards tailored to women's needs (John & Babu, 2021; Khan et al., 2025; Gupta, Singh,& Yadav, 2020). Furthermore, equitable labour policies must recognize the double burden borne by women as both agricultural workers and primary caregivers, ensuring social protections such as maternity benefits, access to childcare, and fair wages (Patel, 2013).

Public health initiatives must also adopt a holistic approach, combining gender-sensitive outreach programs with agricultural extension services to mitigate health risks arising from pesticide exposure, long working hours, and inadequate sanitation facilities in farming communities (Rao et al., 2023). Policy discourse now increasingly advocates for intersectional frameworks that consider caste, class, and other social determinants alongside gender, to effectively target the most vulnerable groups within rural populations (Sen & Mishra, 2022).

Methodology

This study employs anexploratory research methodology to examine the socio-economic background and health challenges faced by agricultural women labourers in selected villagesi.e., Talpali and Nuaparaof Sankirda Gram Panchayat in Bhedenblock andNagpali village in KadobahalofAttabaira blockin Bargarh district, Odisha. Due to ethical reasons pseudo name are used for the name of the village however other details regarding location of the studies are as per the official names. Both primary and secondary data sources were utilised, with primary data collected through structured interviews using a structured interview schedule conducted via personal interviews at the household level. Secondary data were drawn from relevant books, journals, and reports. An exploratory research design guided the study to gain a deeper understanding of occupational and reproductive health issues among respondents. A stratified random sampling technique was employed to select a representative sample of total 100 agricultural women labourers from three villages, ensuring diversity across different social groups between November 2022 and February 2023. About 25 respondents from each section of the society such as SC, STs OBCs and General social groups were selected for the study to have a better understanding of the impact of Green Revolution on health of women working in agriculture across socio-economic groups in rural area of HCA. In addition to the interview schedule, qualitative methods such as case studies, personal interactions, and direct observations were incorporated to provide richer contextual insights. This methodological approach ensures that the findings are both valid and reliable while reflecting the lived experiences of the study population.

Findings

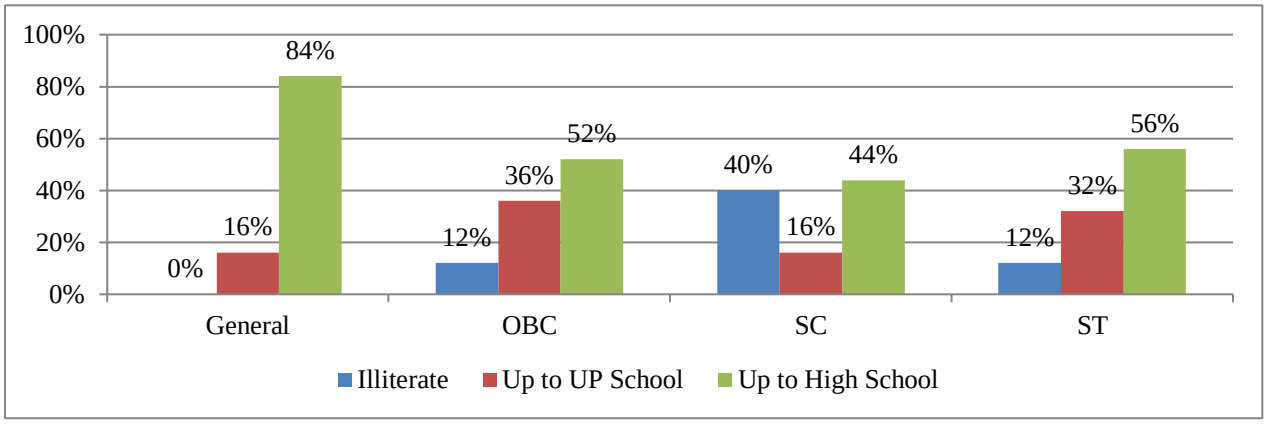
Socio-Economic Profile of Respondents

Educational Background

The educational profile of the respondents reveals significant disparities across social categories. As shown in Figure 1, 84% of women in the General category have received education up to high school, while only 16% are educated up to the upper primary (UP) level. By contrast, 40% of Scheduled Caste (SC) women are illiterate, and only 44% have completed high school education. The literacy rate is somewhat better among ST women (56% high school), though 12% remain illiterate. Among the OBC group, 36% are educated up to UP level, and 52% reached high school level.

This data clearly demonstrates a caste-based gradient in educational attainment, which aligns with structural patterns of marginalization in rural India. The lower educational attainment of SC and ST women has far-reaching implications, particularly in the context of health awareness, reproductive agency, and access to public services (Agarwal, 1997; Kabeer, 2000). Limited literacy restricts their ability to navigate healthcare systems, comprehend medical advice, or participate in welfare schemes.

Figure 1: Distribution of Respondents by Education

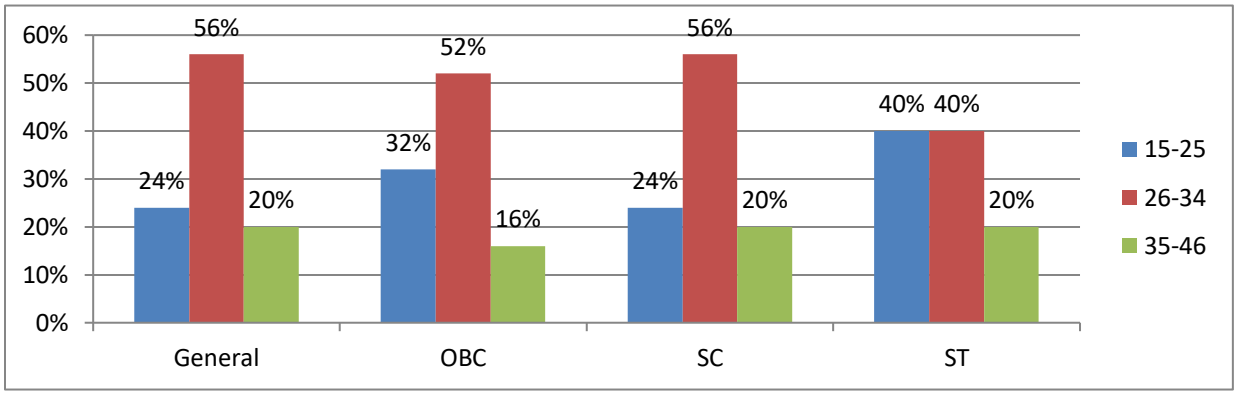


Source: Field Survey, 2022-23.

Age Groups of Respondents

The age-wise distribution in Figure 2 shows that the majority of women labourers fall within the 26–34 age group (51%), indicating the reproductive age window coinciding with peak agricultural involvement. ST women also show significant representation (40%) in the 15–25 age bracket, pointing to early entry into labour markets, possibly driven by economic hardship and early marriage.This trend may increase health risks for young women who undertake heavy labour during critical periods of physical development and reproductive transitions, increasing their susceptibility to maternal complications and undernutrition.

Figure 2: Distribution of Respondents by Age Groups



Source: Field Survey, 2022-23.

Occupational Background

Table 1presents the occupational distribution of respondents which reveals a deeply entrenched caste-based hierarchy in rural employment patterns. It highlights that agriculture remains the dominant occupation of the 54% of the respondent's households, with OBC women showing the highest participation (64%), followed by General and ST women (both 56%). In contrast, only 40% of Scheduled Caste (SC) women reported agriculture as the occupation of their households, suggesting limited access to land or farming resources. Instead, a majority of SC women (60%) are engaged in casual labour, highlighting their greater economic vulnerability and dependence on physically demanding, low-paid work. ST women also show a high labour participation rate (40%), while General and OBC women are comparatively less dependent on such work (32% and 28%, respectively). Participation in non-agricultural livelihoods such as business or salaried

service is minimal—only 5% of women engage in business (mainly from the General category), and just one OBC woman was found in service employment. Notably, no respondents across any caste group reported involvement in skilled trades or professional work. This stark occupational stratification reflects systemic barriers faced by marginalized communities in accessing diversified livelihood options, formal employment, and entrepreneurial opportunities. The data underscores how caste, land access, and socio-economic capital intersect to restrict occupational mobility for SC and ST women, reinforcing cycles of poverty and health insecurity—particularly during reproductive years when labour demands remain unchanged.

Figure3: Distribution of Respondents by Occupational Background

Sl. No.	Source	General		OBC		SC		ST		Total	
		N	%	N	%	N	%	N	%	N	%
1	Agriculture	14	56.00	16	64.00	10	40.00	14	56.00	54	54.00
2	Business	3	12.00	1	4.00	0	0.00	1	4.00	5	5.00
3	Service	0	0.00	1	4.00	0	0.00	0	0.00	1	1.00
4	Labour	8	32.00	7	28.00	15	60.00	10	40.00	40	40.00
5	Any Other	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Total		25	100	25	100	25	100	25	100	100	100

Source: Field Survey, 2022-24.

Housing and Basic Amenities

As evident in Figure 4, the vast majority of SC (96%) and ST (72%) respondents live in *kachha* (mud/temporary) houses, compared to only 32% among General category women. Pucca (permanent) housing is extremely limited among marginalized groups—only 4% SC and 12% ST respondents have such housing.Access to essential amenities like toilets, clean water, and gas is minimal in SC/ST groups. For example, only 4% of SC respondents had access to a toilet, compared to 80% among General category women (as stated in Table 3.6). This housing inequality mirrors deeper structural exclusions tied to caste, where sanitation and housing quality directly affect maternal and reproductive health outcomes.Together, these socio-economic indicators paint a clear picture: women from marginalized castes are trapped in a cycle of limited education, hazardous labour, substandard housing, and poor health infrastructure. These

disadvantages reinforce one another, contributing to systemic reproductive health risks—a pattern observed in wider literature on intersectionality and rural gender inequity (Sen &Ostlin, 2008; Desai & Banerji, 2008).

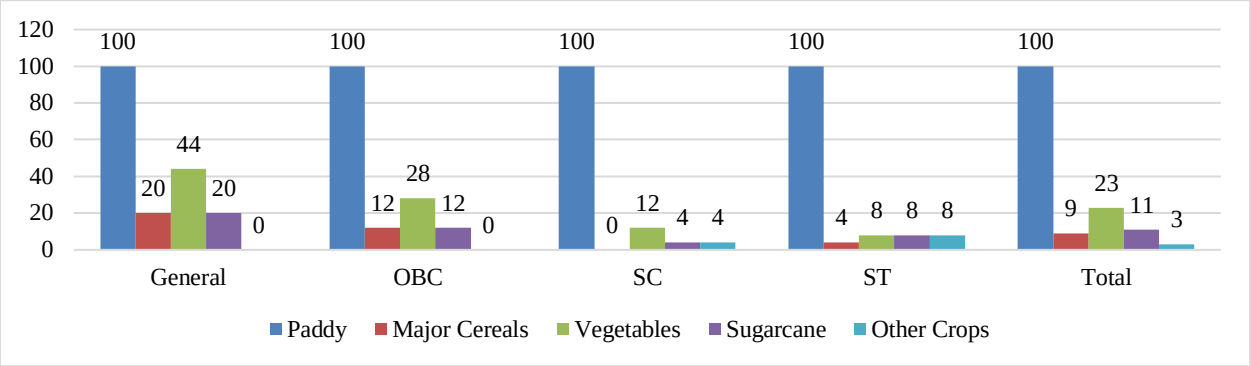
Crops and Women Agricultural Labour

The crop-wise distribution of work among women agricultural labourers shows a consistent and overwhelming engagement in paddy cultivation, with 100% participation across all caste groups — General, OBC, SC, and ST. This suggests that paddy is the foundational crop in the agrarian economy of the region studied and that women's labour is essential to its production. Beyond paddy, however, there are stark variations in crop diversification based on caste. General category women show the highest level of diversification: 44% are involved in vegetable cultivation, 20% in major cereals, and 20% in sugarcane farming. This likely indicates relatively better access to land, irrigation, and markets, enabling them to engage in higher-value or cash crops alongside staple grains.

Further, OBC women also participate in vegetable (28%) and cereal (12%) cultivation, although to a lesser extent. SC women's labour is the most concentrated, with only 12% engaged in vegetable production and negligible involvement in other crops—highlighting their limited access to diversified farming opportunities. ST women exhibit modest participation across several categories—8% in vegetables, 8% in sugarcane, and 4% in cereals—indicating slightly broader engagement than SC women but still constrained compared to General and OBC groups.

The overall picture reveals a high dependence on paddy, and minimal involvement in higher-value or alternative crops, especially among SC and ST women. This suggests that caste-based structural limitations—such as lack of land, credit, irrigation, and extension services—continue to restrict the agricultural agency of marginalized groups. The absence of "other crops" entirely among General, SC, and OBC women, and minimal involvement by ST women, further points to a narrow agricultural labour scope. These patterns underscore the need for targeted interventions that promote crop diversification and value chain inclusion for women from marginalized communities.

Figure 4:Crops in Which Women Agricultural Labourer Works



Source: Field Survey 2022-23.

Agricultural Practice: Methods of Cultivation, Type of Seed and Fertilizer Used

The analysis of agricultural inputs and practices highlights both common patterns and caste-based variation in the adoption of modern agricultural techniques. Across all caste groups, the usage of high-yielding variety (HYV) seeds is found to be most common practice, with 100% adoption among General and OBC women, and 96% among SC and ST households. Indigenous seed usage is minimal, with only 4% of ST respondents using them, and none among the other groups, indicating a widespread shift to modern seed varieties across caste groups. However, social group wise differences emerge in the method of cultivation, where tractor usage is highest among General (92%) and ST (84%) respondents, reflecting relatively higher adoption to mechanisation. In contrast, greater reliance on traditional tools like wooden ploughs found among SC and OBC households, with 40% in both groups still using them—suggesting limitations in capital, access to credit, or infrastructure (Figure4).

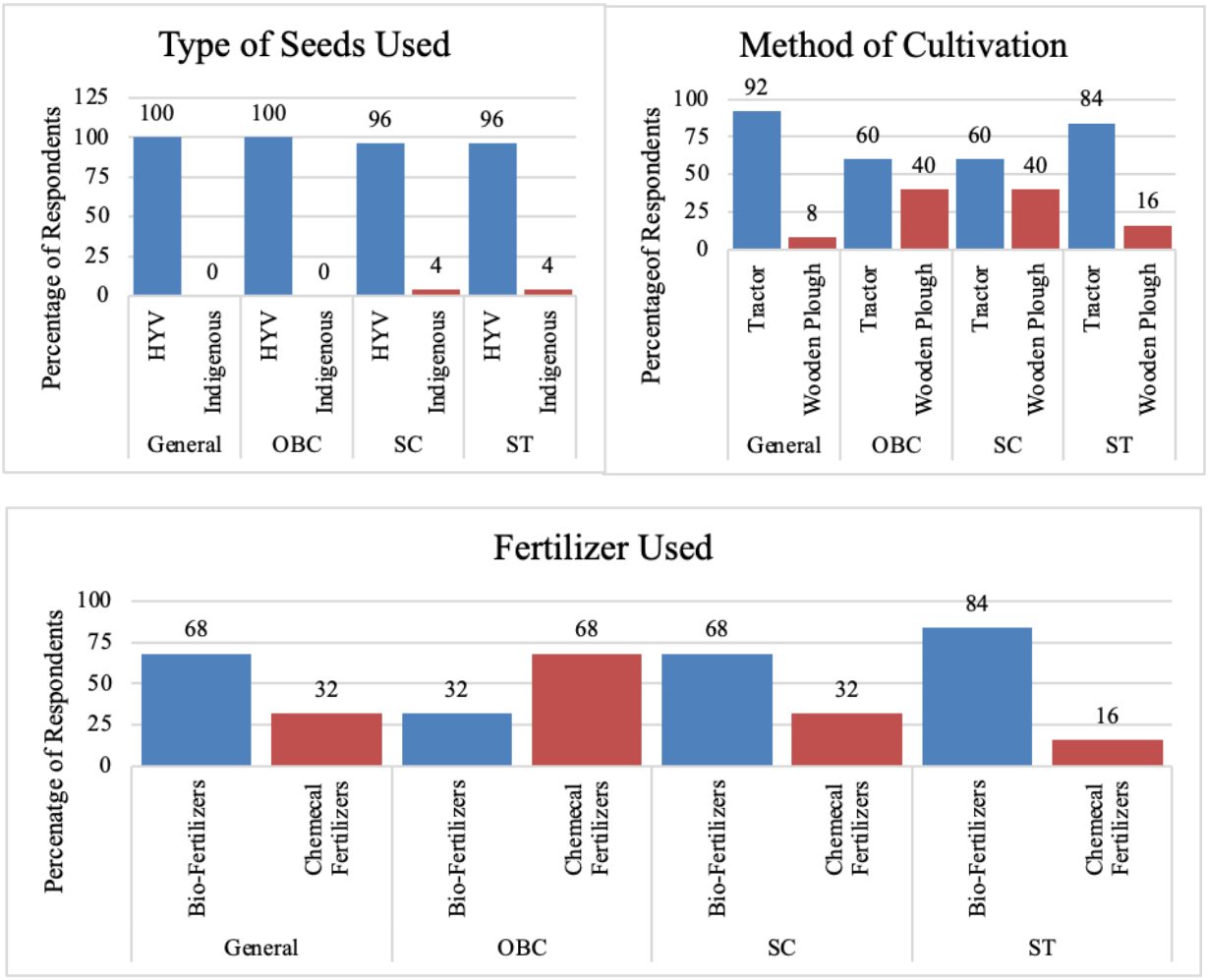


Figure 5:Methods of Cultivation, Type of Seed and Fertilizer Used

Source: Field Survey 2022-23.

A more noticeable divide appears in the type of fertilizer used. While 68% of women across General, OBC, and SC groups use bio-fertilizers, only 32% in each of these groups use chemical fertilizers, likely reflecting a partial shift toward more sustainable inputs or affordability concerns. However, ST women display a significant difference: 84% rely on bio-fertilizers, and only 16% use chemical ones. This may indicate either a lack of access to chemical fertilizers or a stronger dependence on traditional or low-cost methods, possibly due to economic or ecological constraints in tribal areas. These patterns suggest that while the overall shift toward modern agriculture (HYV seeds and mechanization) is evident, disparities in access to resources like

tractors and chemical fertilizers persist along caste lines, reinforcing structural inequalities in agricultural productivity and resilience.

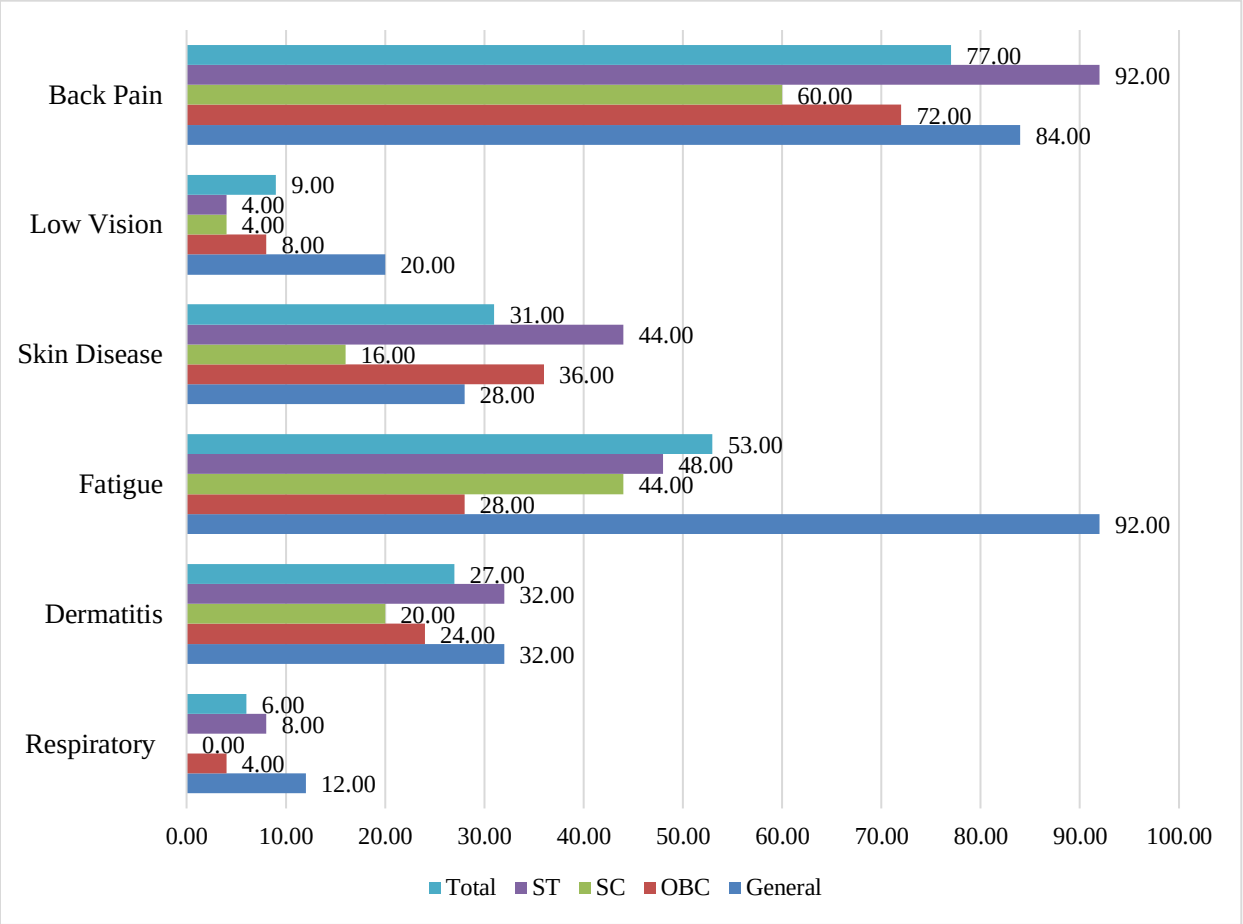
Common Health Problem Faced by Respondents

The data on general health problems among women agricultural labourers reveals alarming trends that underline the physical toll of agrarian labour, with clear caste-based variations in vulnerability. Figure 6 illustrates that back pain emerges as the most pervasive health issue, affecting 92% of ST women, 84% of General, 72% of SC, and 60% of OBC respondents. This widespread problem is likely linked to prolonged physical labour, lack of ergonomic tools, and inadequate postnatal recovery among rural working women. Following this, fatigue is the next most commonly reported condition, experienced by 92% of General women, 53% of OBC, 48% of ST, and 28% of SC women. The extraordinarily high fatigue levels among General women may be attributed to their dual burden of agricultural and domestic work.

Skin diseases also appear prominently, especially among ST (44%) and OBC (36%) women, indicating frequent exposure to agrochemicals without protective equipment. SC and General respondents reported lower prevalence (16% and 31%, respectively), which might be due to less direct exposure or better coping strategies. Dermatitis was equally prevalent among General and OBC women (32%), followed by ST (27%) and SC (20%), reinforcing concerns about chemical exposure in crop handling. Low vision was reported most among General respondents (20%), while SC and ST (4% each) and OBC (8%) reported fewer cases—possibly reflecting differences in age, workload, or access to vision screening services.

Further, respiratory problems, though less common overall, were highest among General respondents (12%), possibly linked to dust exposure during post-harvest activities or burning of biomass fuels. SC and ST respondents reported no respiratory issues, which may either reflect actual trends or underreporting due to lack of diagnosis. Overall, the chart illustrates a clear pattern of occupational health degradation, intensified by caste, workload type, and socio-economic conditions. It calls for urgent intervention in the form of health education, safety training, regular health checkups, and access to basic healthcare for women working in agriculture—especially for ST and SC groups who may lack the means or access to mitigate long-term health effects.

Figure 6: Distribution of Respondents by Health Issues they Faces



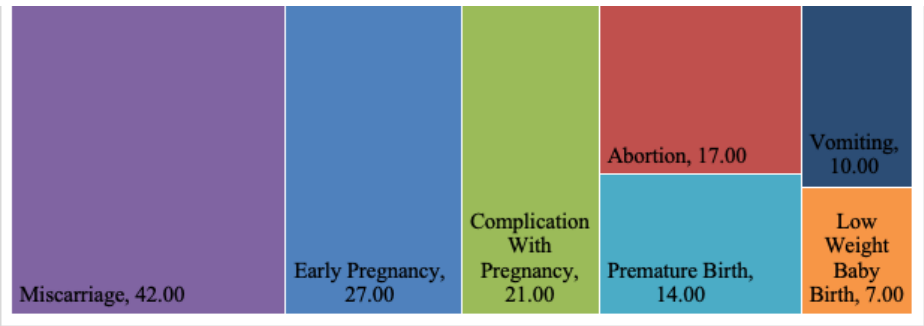
Source: Field Survey, 2022-23.

Prevalence of Reproductive Health Issue

Figure 7 andFigure 8 reveals a concerning prevalence of reproductive health issues among women agricultural labourers, with significant variation across caste groups. Early (or young age) pregnancy is one of the most widespread reproductive health concerns, affecting 48% of ST and General category respondents, followed closely by 44% of SC and 40% of OBC women. This trend strongly reflects the persistence of early marriage and early childbearing among marginalized rural communities, particularly among tribal and SC/ST women, increasing the risk of pregnancy complications and maternal mortality. Miscarriage also presents a major issue, with 32% of General and 24% of SC women affected, suggesting the impact of heavy labour,

malnutrition, and chemical exposure during critical reproductive periods. SC women report the highest rates of pregnancy complications (20%), highlighting the compounded effects of healthcare inaccessibility and hard physical work. Further, premature births were particularly notable among SC women (12%) and, to a lesser degree, ST and OBC women (8% each). Low birth weight babies, a common indicator of maternal malnutrition and inadequate antenatal care, were reported by 8% of General women and 4% of ST and SC women.

Figure 7:Reproductive Health Issues Encountered by Women Agricultural Labourer



Source: Field Survey 2022-23.

Another notable finding is the prevalence of abortion, which stands uniformly at 16% across General, OBC, and SC categories, and slightly lower among ST women (12%). This consistency may reflect both spontaneous and induced abortions linked to exhaustive work conditions, lack of family planning, or limited access to safe abortion services. The occurrence of vomiting during pregnancy—a symptom that can indicate more serious health stress or hormonal imbalance—was highest among General women (20%), possibly suggesting greater awareness and reporting, or differences in dietary patterns and healthcare engagement. Further, Figure 6 presents a critical health snapshot, reinforcing that women agricultural labourers—especially those from SC and ST backgrounds—face a high burden of reproductive morbidity. These outcomes are shaped by early marriage, inadequate nutrition, strenuous labour, poor antenatal care, and systemic neglect. The data underscores the urgency for caste-sensitive reproductive health policies, improved family planning outreach, and labour protections for pregnant women in rural agrarian settings.

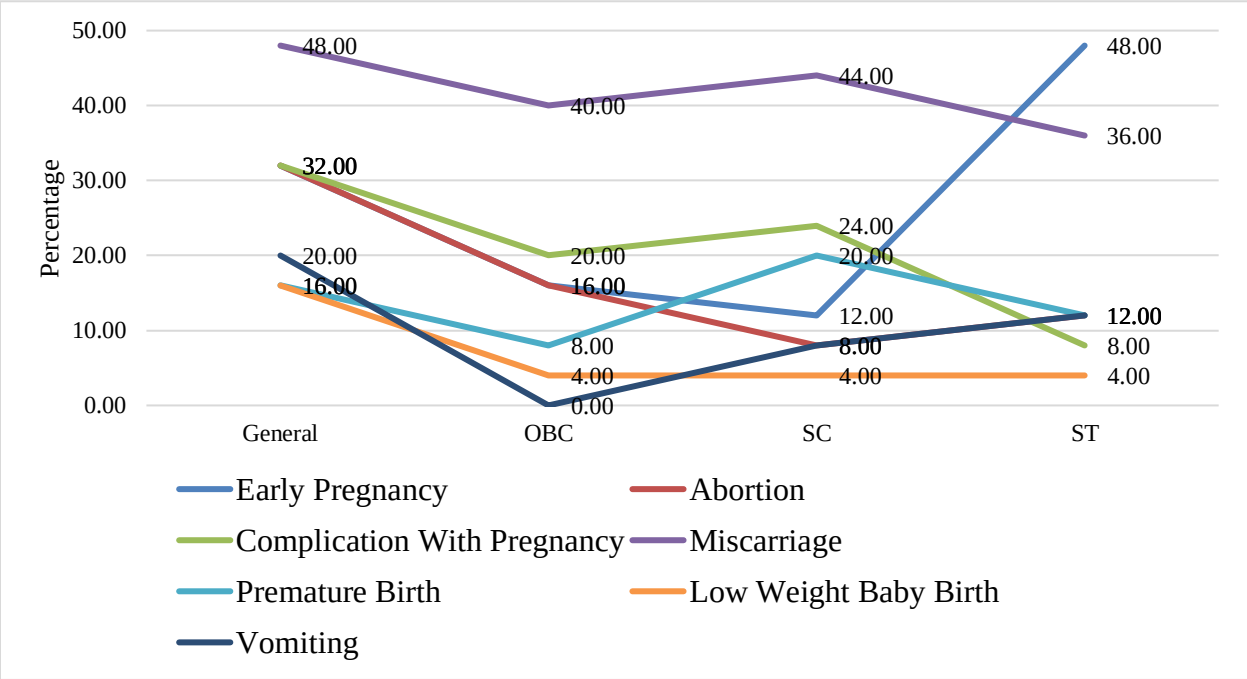


Figure 8: Social Category-Wise Health Issues faced by Women Labour

Source: Field Survey 2022-23.

Wage Earning During Pregnancies

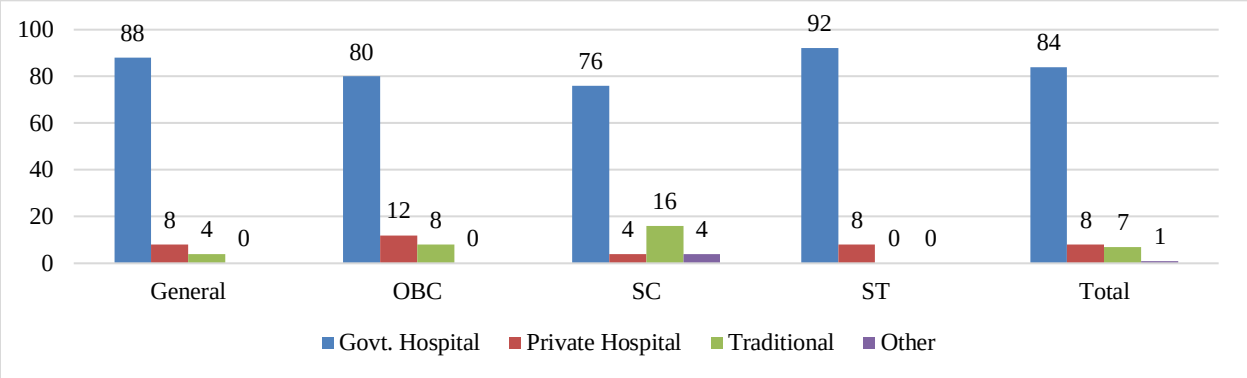
Figure 9highlights a significant and concerning trend: a large majority of women across caste groups continue to work as agricultural labourers during their pregnancy. The chart shows that 80% of Scheduled Caste (SC) women worked during their pregnancy—the highest among all groups—followed closely by 76% of Scheduled Tribe (ST) women and 72% of Other Backward Class (OBC) women. Even among General category respondents, 68% reported labouring during pregnancy, bringing the overall average participation to a high 74%. This widespread engagement reflects the economic compulsion faced by rural women, particularly those from marginalized communities, where household survival often hinges on women's labour income—even during vulnerable stages like pregnancy.

The remaining 20–32% who reported not working during pregnancy may have had relatively better financial support, smaller family sizes, or more access to maternity services and social schemes. However, the disproportionately high rates of labour among SC and ST women

indicate entrenched structural inequities. These women are not only economically disadvantaged but often lack access to supportive family systems, maternity leave, or government safety nets that would allow them to rest during this critical period.

From a reproductive health perspective, working during pregnancy—especially in strenuous, chemical-laden agricultural environments—has been linked to increased risks of miscarriage, low birth weight, premature birth, and maternal fatigue. The data underscores an urgent need for maternal health protections in informal rural labour, including cash incentives, guaranteed rest periods, improved awareness, and access to ASHA and Janani Suraksha Yojana services. Without such support, pregnancy becomes not only a biological vulnerability but also a site of deep social and economic injustice—particularly for the most marginalized women in rural India.

Figure 9: Accessibility to Health Care Facility



Source: Field Survey 2022-23.

Types of Health Service During Pregnancy

Figure 10 reflects the extent and limitations of maternal healthcare access among agricultural women labourers during pregnancy. Encouragingly, 100% of respondents across all caste groups received medicine and vaccination services, indicating broad success in delivering the most basic maternal health interventions. This consistency suggests effective outreach by frontline health workers like ASHAs, as well as positive uptake of government-mandated antenatal care protocols such as iron and folic acid supplementation and tetanus vaccination. However, beyond

this core care, economic and caste-based disparities emerge in access to additional forms of support.

Access to monetary support—such as conditional maternity benefits under schemes like Mamata or Janani Suraksha Yojana—varies widely. While 68% of General category women received financial assistance, this drops to 60% among OBC, 52% among SC, and only 64% among ST women. The lower participation of SC women in cash benefits may indicate barriers in scheme registration, awareness, or eligibility enforcement, all of which disproportionately affect marginalized communities. This economic support is critical for nutrition, rest, and healthcare access during pregnancy, and the gap here likely exacerbates reproductive health risks for those without it.

A smaller fraction of women reported receiving "other" types of assistance, such as nutritional counselling, home visits, or supplementary food. Only 24% of General, 4% of OBC, and 0% of SC women reported any such additional support, suggesting that value-added services are unevenly distributed and possibly biased toward more privileged social groups. Overall, while basic health interventions like vaccination and medicine are well-covered, financial and holistic maternal support services remain inequitably accessed, particularly by SC and OBC women. This highlights the need for better targeting, transparency, and grassroots support to ensure inclusive maternal care in rural agricultural contexts.

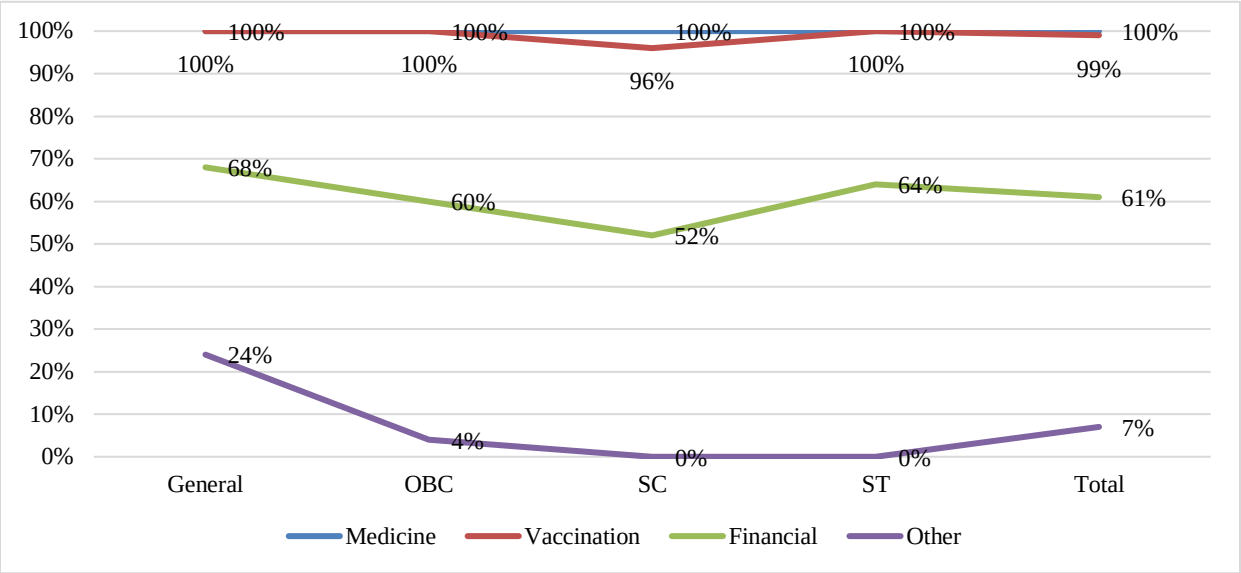


Figure 10: TypesService Availed During Pregnancy

Source: Field Survey 2022-23.
Note: Multiple Response

Discussion

Socio-Economic Stratification and Health Inequity

The findings indicate that caste-based stratification plays a significant role in determining the socio-economic position and, consequently, the health vulnerabilities of women agricultural labourers in Odisha. Educational attainment, housing type, and occupational roles are clearly skewed in favour of General category women, who demonstrate higher literacy (84% up to high school) and slightly more diversified income sources (e.g., business), compared to SC and ST women, who largely engage in low-paying labour with minimal security (Figure: Occupational Status). This aligns with Deshpande (2011) and Thorat & Newman (2010) who argue that caste hierarchies in India systematically restrict access to education, capital, and land, reinforcing poverty and dependence on exploitative labour.Further, poor housing (e.g., 96% of SC women live in *kachha* houses), inadequate sanitation, and reliance on informal irrigation directly correlate with diminished physical and reproductive health outcomes, consistent with findings by Sen and Ostlin (2008) on social determinants of women's health in agrarian economies.

Health Burdens of Agrarian Labor and Gender

A critical outcome of the study is the widespread incidence of occupational health problems among women—particularly back pain (92% among ST), fatigue (92% among General), and skin diseases (44% among ST)—all linked to intense manual labour without ergonomic support or protective equipment (Figure: General Health Problem). This supports earlier research by Sen &Mishra (2022) that underscore the physical degradation faced by rural female labourers due to long hours in harsh field environments.These general health issues are exacerbated during pregnancy, with over 74% of all respondents continuing agricultural labour during pregnancy, peaking at 80% among SC women. This labour persists despite known reproductive health risks such as miscarriage, complications, and low birth weight—a trend echoed by Gupta et al. (2020) who noted a high correlation between strenuous work and adverse pregnancy outcomes in rural Indian women.

Reproductive Health and Caste-Based Vulnerabilities

The analysis of reproductive health (Figure: Reproductive Problems) reveals that teenage pregnancy (highest among ST and SC women), miscarriage, and pregnancy complications are widespread across marginalized groups. This aligns with Jejeebhoy&Sathar (2001) who emphasized that early marriage, poor nutrition, and low autonomy significantly contribute to poor maternal outcomes in India. The high incidence of complications (20% SC) and miscarriage (32% General, 24% SC) also reflects findings by Brainerd & Menon (2014) on Green Revolution-affected zones where exposure to agrochemicals is linked with disrupted hormonal cycles and poor foetal development.Access to maternal healthcare is unequally distributed. While nearly all women received basic services like medicine and vaccination (100%), cash incentives under schemes such as Mamata or Janani Suraksha Yojana reached fewer SC women (52%) compared to General (68%) (Figure 9&Figure 10). This gap in benefit distribution may reflect bureaucratic filtering, a lack of awareness, or institutional bias—phenomena discussed in De (2015), who argue that intersectional disadvantages hinder scheme penetration.

Role of the State and ASHA Workers

Despite structural issues, the role of ASHA workers appears impactful, with over 76% of ST and OBC women reporting ASHA support during pregnancy. However, formal programmatic support beyond this—like nutritional advice or family planning counselling—remains patchy. Only 52% of General women and 16% of SC women reported adopting family planning methods, reflecting socio-cultural reluctance and poor health education.As Ravindran & Gaitonde (2018) note, frontline health workers are critical in translating policy to practice, but they require robust training, local language capacity, and institutional backing to bridge these persistent gaps.

Intersectionality and Structural Reproductive Injustice

These findings underscore how caste, class, and gender intersect to produce structural reproductive injustice. Women from SC and ST groups face a compounded burden of physical labour, early marriage, lower education, poor healthcare access, and higher risk pregnancies—all while occupying the lowest rungs of the rural economy. These patterns validate the theoretical frameworks of Crenshaw (1989) on intersectionalityand Mies (1980) on subsistence labour exploitation.Interventions must thus go beyond health and include land rights reform, education access, nutrition programs, and caste-sensitive service delivery. Without addressing the foundational socio-political structures, maternal health disparities in rural India will remain deeply entrenched.

Conclusion

This study explored the reproductive health conditions and socio-economic circumstances of women agricultural labourers in Odisha in the context of structural transformations introduced by the Green Revolution. Through a caste-sensitive and intersectional lens, the research has highlighted how historically marginalized groups—particularly Scheduled Castes (SC) and Scheduled Tribes (ST)—continue to face disproportionate burdens in rural labour economies. Despite the promise of development that accompanied agricultural modernization, its benefits have bypassed large segments of rural women, who remain at the confluence of caste, class, and

gender-based exclusions. The findings indicate that while all caste groups predominantly work in paddy cultivation, SC and ST women have limited access to land, credit, and irrigation, forcing them into more exploitative labour arrangements. Their overrepresentation in casual agricultural labour, coupled with low educational attainment and poor housing, exacerbates their health vulnerabilities. The widespread use of hybrid seeds, chemical fertilizers, and mechanized farming methods may have improved productivity but has also exposed women to occupational hazards. These include chronic fatigue, skin diseases, back pain, and respiratory issues, which are especially severe among those who continue to work during pregnancy.

One of the most concerning revelations is that a significant number of women—up to 80% in the SC category—continue working in the fields during their pregnancy. This situation is fueled by economic necessity and the lack of institutional protections. The study also reveals that although basic reproductive health services like vaccinations and medicines are accessed by nearly all respondents, there are glaring disparities in financial support and access to holistic care. SC and ST women are less likely to receive monetary benefits or supplementary services during pregnancy, despite being the most economically vulnerable. These findings reflect the shortcomings of existing state interventions such as ASHA, Mamata, and Janani Suraksha Yojana. While these programs have certainly increased access to basic care, they have not addressed the deeper structural inequities that determine how caste and gender shape maternal health outcomes. In many cases, the implementation of these programs fails to reach the most marginalized due to bureaucratic hurdles, lack of awareness, and caste-based discrimination at the point of service delivery.

Finally, reproductive health cannot be viewed in isolation from women's roles in agriculture, their socio-economic status, and the structural inequities rooted in India's caste hierarchy. The Green Revolution, while transforming Indian agriculture, did little to improve the conditions of women labourers who continue to support the sector through invisible and undervalued labour. There is an urgent need for integrated policy approaches that bridge agriculture, labour, and health. Interventions must include not only improved healthcare access but also structural reforms—land rights for women, access to education, legal labour protections during pregnancy, and robust public health outreach in tribal and Dalit regions. Only by recognizing the reproductive rights of women agricultural workers as a matter of social justice can we move

toward an inclusive model of development that values both the labour and the life of rural women.

Ethical Statement: All the respondents were given full disclosure of the purpose of this study and interviews were conducted with their consent. Due to ethical reasons the name of the villages and respondents are replaced with pseudo-names to protect the privacy and anonymity of the respondents.

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