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A COMPREHENSIVE EPIDEMIOLOGICAL CASE STUDY OF TYPHOID FEVER IN KEONJHAR DISTRICT, ODISHA, INDIA

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ABSTRACT Typhoid fever, is caused by Salmonella enterica serovar Typhi, remains a significant public health challenge in endemic regions of India, particularly in resource limited districts is Keonjhar, Odisha. This study represented a comprehensive epidemiological case study of typhoid fever over a ten-year period (2016-2025), by uses secondary data to asses temporal variation, spatial distribution, Gender distribution, Mortality pattern and positivity Rates. The year wise analysis shows a variation from 9,104 in 2016 to a peak of 22,058 in 2024, by a steady decreasing in 2025. The CFR persisted at low level. Ranging between 0.65% to 1.56%, corresponding with global estimates approximately 1%. Block wise distribution shows geographical variation, like Sadar, Joda, and Telkoi reported the highest number of cases, indicate transmission may be possible to sanitation and water quality. Gender-wise analysis reported a higher number of cases among females as compare to males. The findings represented that the persistent burden of typhoid fever in Keonjhar district and highlight the need for targeted public health interventions, in addition to improvement of water supply, sssanitation, health education system, vaccination strategies and antimicrobial management. This study provides valuable baseline measurements to support evidence-based decision making and future research aimed to control and prevent the typhoid fever in endemic regions.

KEYWORDS : Keonjhar, Salmonella Enterica Serovar Typhi, Typhoid

INTRODUCTION

Typhoid fever is a example of neglected infectious disease, it continue to pose a significant burden of disease in low and middle-income countries, contributing greatly to both illness and mortality. So in order to explore the determinants of its transmission, a case study was conducted in Keonjhar, Odisha (Mogasale et al.,2014). The etiological agent responsible for causing this bacterial food/waterborne infectious disease is Salmonella enterica subspecies enterica serovar Typhi (Salmonella typhi) (Harikrishnan et al.,2018). Human acts as a reservoir of Salmonella typhi with disease transmission happening via the fecal oral route. Salmonella typhi cannot multiply well outside the human body, however it can survive in the environment for long periods. In the acute phase, infection due to Salmonella typhi is expressed as a typhoid fever. It is also known as Enteric fever (Mitscherlich & Marth,1984). Typhoid fever is primarily spread through the fecal-oral route, where individuals become infected by consuming contaminated food or water (Crump et al.,2004). Poor-quality drinking water, inadequate hygiene and low sanitation systems contribute to its transmission (World Health Organization, 2018). Individuals who carry the infection without showing symptoms can continue to shed the pathogen and continue to its transmission, particularly when they involved in preparing or serving food (Stanaway et al.,2019). Direct person-to-person spread may also occur when hygiene practices are poor, particularly if individuals fail to wash their hands their hands properly after using the toilet. In such environments, those living in close contact with an infected person, including family members and relatives, are more likely to be exposed to the infection (CDC,2023).

MATERIALS AND METHODS

A retrospective study was conducted in the northern inland district of Odisha to study ten years data of Typhoid recorded and monitored under the Integrated Disease Surveillance Programme (IDSP), which is a part of the National Health Mission (NHM). The unit of analysis for the study was the district, Keonjhar.

RESULTS

To analyze the effect of Typhoid on people of Keonjhar district, the researchers initially visited to local Primary Health Centers (PHCs), private clinics, hospitals, tertiary care centers and water treatment facilities. This type of visits aimed to analyze diagnostics patterns and determined measure local hygiene standards related to waterborne diseases. The dataset provided offers a comprehensive year-wise overview of typhoid cases and fatality rate over ten years span from 2016-2025. This longitudinal data reveals several noteworthy trends, fluctuations in case numbers and significant progress in managing the disease, especially in terms of reducing mortality.

In 2016, the district recorded 9,104 typhoid cases with 135 fatalities, resulting in a 1% death rate. In the subsequent years, a gradual rise in the number of cases observed. The number of cases increased to 11,325 cases in 2017 with 125 fatalities, resulting in a 1% death rate and in 2018 the number of cases is 12,649 with 127 fatalities resulting in a 1% (round off) death rate. This Indicate a progressive upward trend in disease occurrence. A slight decline was seen in 2019 with 12,164 cases, with 136 fatalities.

A significant decline in the number of cases was recorded in 2020, where 7,336 cases representing the lowest occurrence during the study period with 115 fatalities, the no of fatality also decline in the same year. Despite the lower number of cases and cases fatality rate was comparatively was comparatively higher at approximately 2%. Suggesting in COVID situation so fatality rate increases.

After 2020, a gradual rise in typhoid cases was noted. In 2021 the number of cases was increased to 11,958 associated with 120 fatalities. This rising trend continued in 2022, with 13,158 reported cases and 138 deaths. A substantial rise was noted in 2023, where the number of cases reached 16,676 whereas the number of deaths slightly decreased to 132.

The increasing trend reached its maximum number in 2024, which observed the highest number of typhoid cases 22,058 in addition to the highest number of deaths 145. This suggests a substantial rise in the overall burden. In 2025, a limited decline in the number of cases was recorded, with 18,432 cases reported, with 140 deaths.

Fig- 1: The Year-wise Distribution of Typhoid Cases within a Span of Last Few Years.

The given data provides an overview of reported attacks and deaths across 13 administrative blocks. Each block has been analyzed based on the number of attacks, deaths and the percentage of deaths (rounded off). The total number of attacks recorded across all blocks is 134,860 while the total number of deaths stands at 1,313 leading to an overall death percentage of approximately 1%. This low mortality rate indicates that while attacks are occurring, most do not result in fatalities reflecting either the non-lethal nature of these incidents or the effectiveness of healthcare and emergency responses.

Among to all the blocks, Sadar reported the highest number of affected individuals, accounting for a total of 21,161 cases, followed by Joda with 17,715, Telkoi with 11,862, Ghatagaon with 11,672 and Saharapada with 11,244. Despite the high magnitude of cases, the round off death percentage in these blocks persists approximately 1%. To illustrate, Sadar block reported 207 deaths, which is consistent with 1% death rate even after rounded off.

Similarly, blocks like Champua (9,845 cases, with 92 deaths), Ghasipura (9,986 cases, with 75 deaths), and Harichandanpur (8,394 cases with deaths). These three blocks also show a sustained rounded-off death percentage of approximately 1%.

Patna block shows a slight variation in the observed pattern, with 6,432 number of affected cases and 99 number of deaths. It reported a round-off death percentage of approximately 2%, which is relatively higher than the other blocks. This indicates that in spite having a moderate number of affected cases, and the fatality rate is relatively enhanced.

Blocks like Banspal (7,035 cases, with 89 deaths), Jhumpura (6,493 cases, with 75 deaths), ana Hatadihi (8,106 cases, with 79 number of deaths) also maintain a round off death percentage of 1%. The observation said that mortality remains stable across most of the regions. Anandpur block, reported the lowest number of affected cases with 4,915 and also the lowest numbers of deaths 21. It shows a round-off death percentage of 0%, represents extremely low mortality.

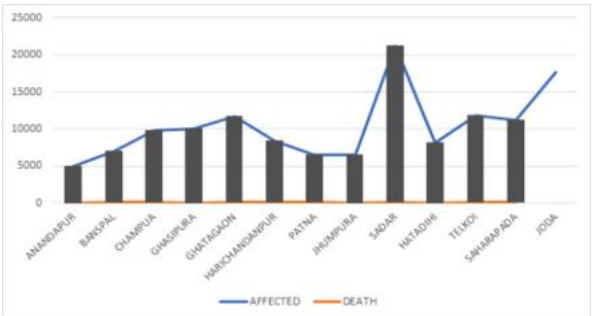

Fig- 2 The Block -wise Distribution of Typhoid Cases within a Span of Last Few Years.

Based on the percentage distribution presented in, a clear gender-wise variation in the distribution of typhoid cases is observed over the study period (2016-2025). Females constitute for a significantly higher proportion of total affected cases, accounting for 60.29%, however males represent 39.71% of the total affected cases. No cases were reported under the transgender category (0%), showing either negligible potential are reporting within this group throughout the study period.

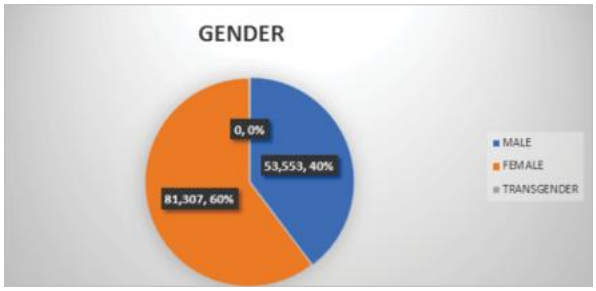

Fig- 3 The Gender -wise Distribution of Typhoid Cases within a Span of Last Few Years.

DISCUSSION

According to the National Health Mission data, the incidence rate of typhoid fever in Overall keonjhar district had an magnitude in 2016-2025. The year-wise distribution suggests that the number of affected cases increased from 9,104 in 2016 to a peak of 22,058 in 2024, which is followed by a modest fall in 2025. This trend implies a continuing presence and likely of typhoid transmission within the study. However, in spite the increasing number of cases and the number of deaths relatively constant during the study period. The case fatality rate falls from 1.48% in 2016 to 0.65% in 2024, demonstrating improved diagnosis, treatment and awareness. A small pickup in 2020 (1.56%) may be attributable to healthcare interruptions during the COVID-19 pandemic and late treatment.

The block-wise distribution demonstrates considerable geographical variation, with Sadar being the key hotspot with the highest cases (21,161) and deaths (207). Blocks like Joda, Telkoi, and Ghatagaon also show significant burden whereas Anandapur has the lowest death percentage (0.42%).

From the gender-wise distribution, Females were consistently more affected than males, throughout the study period. In 2017 female cases (8,532) were higher than the male cases (2,793).

CONCLUSION

Typhoid fever remains a persistent in public health challenges in low and middle-income countries, reflecting the complex alignments of environmental exposure, socioeconomic imbalances, and systemic limitations in healthcare delivery. The findings of this study demonstrate that transmission mechanisms are strongly mediated by access to safe drinking water, poor sanitation infrastructure, and hygiene practices. Which collectively maintain the endemicity of Salmonella enterica serovar Typhi within the high-risk populations. The unequal burden observed among children and young adults further emphasize the role of behavioral exposure and risk of awareness in disease susceptibility and progression. In spite of the implementation of targeted public health interventions, including water, sanitation, and hygiene (WASH) programs and extended primary healthcare service delivery, the constancy of typhoid incidence indicates limited effectiveness in fully disrupting transmission pathways.

Government-led programmes such as Swachh Bharat Mission and Har Ghar Jal Yojana in Odisha, is a part of the national Jal Jeevan Mission (JJM), goals to provide safe, piped tap water to all rural households by 2024. These

infrastructural and behavioural gaps continue to enable fecal-oral transmission cycles. It is the role of asymptomatic and chronic carriers in maintaining transmission within the community.

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