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Healthcare Services for Coastal Fisher Folk: An Empirical Study from the Selected Districts of Kerala

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Abstract

This study explores the availability, accessibility, and usage of healthcare services among coastal fishermen in two selected districts of Kerala, India—Kannur and Alappuzha. Using the Multidimensional Poverty Index (MPI) and one-way ANOVA, the research investigates healthcare disparities, infrastructure differences, and the prevalence of lifestyle-related illnesses among 90 fishermen. Results reveal that Kannur offers relatively better access to primary healthcare facilities, while Alappuzha struggles with geographical and infrastructural barriers, despite both regions having public healthcare options. Interestingly, many fishermen in Alappuzha opt for private hospitals, perceiving them as providers of higher-quality care. The MPI analysis indicates a slightly higher level of multidimensional poverty in Kannur. Additionally, both districts report significant incidences of lifestyle diseases such as diabetes, hypertension, and osteoporosis, with Kannur showing notably higher rates. These health challenges are compounded by socio-economic limitations and varying levels of healthcare infrastructure. The study highlights the need for policy interventions that focus on improving healthcare infrastructure, promoting health education, and reducing financial burdens through subsidies and insurance schemes. It also suggests that future research include gender-disaggregated data and apply multivariate analysis to better understand the interrelations between poverty, geography, and healthcare outcomes. These insights are crucial for developing equitable healthcare strategies tailored to the unique needs of coastal fishing communities.

Keywords: Coastal Fishermen, Healthcare Accessibility, Healthcare Services, Lifestyle Diseases, Multidimensional Poverty Index (MPI).

Introduction

Maintaining good health is essential for individuals to sustain successful livelihoods in the natural environment. Communities that rely on resources such as fishing communities (1). Numerous pressures such as diminishing fisheries, global warming, and extensive industrial fishing. The fishermen and their livelihoods are now in a serious predicament as a result of the circumstances. The well-being of the marine fishing community's physical and mental health (2). The act of fishing communities faces various health hazards because of the type of work they do. Inferior living arrangements and inadequate sanitation facilities (3). The fishing communities' health is in a disadvantaged state. Important consequences for the societal cohesion, financial feasibility, and long-term endurance of fishing industries stated (1). It is increasingly acknowledged that social factors are essential for sustainable fisheries. The enduring nature of fishing communities is being analysed (4, 5). Maintaining human well-being plays a key role in promoting social sustainability (6). Research has demonstrated a correlation between the health of communities and the health of ecosystems (7). As an example, incorporating elements of community health into implementing environmental actions could enhance efficiency and cost-effectiveness in managing natural resources handling of tasks and responsibilities. Health interventions provide a great opportunity and help build trust establishing a connection between the environmental groups and the local communities. Current times have shown conservation efforts endorse fortress conservation strategies, aiming to separate people from the environment. Biodiversity is not taken into account without considering developmental aspirations of communities or their welfare (8). Several conservation projects within local communities are currently in progress heavily

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favouring conservation goals over community goals often resulting in skewed outcomes due to a rise in stress and disputes regarding rights and entry. With the established connections in place, we think that concentrating on a holistic approach is important for both community health and ecosystem health could help achieve improved environmental results without sacrificing community welfare. Community health programs help involve a larger range of people and empower them to participate in less privileged groups, alleviate poverty, promote social unity, lower the influence of external factors like earthquakes can result in improved management of the environment resourced that are relied upon (7). Many businesses have experienced significant changes over the past ten years. Combined initiatives for community health and resource management have shown noticeable results advantages such as boosting the ability of communities to adapt and become more resilient. A few instances such as Blue Ventures includes the Population Health and Environment Program (PHE), Madagascar, the Integrated Program for the Oceanic Preservation and Conservation of Resources Management (IPOPCORM) run by PATH Foundation in the Philippines are mentioned in the text (9, 10). The most recent national health policy in India aims to improve the health and well-being of people through preventive and promotional healthcare, as well as providing access to quality healthcare services without financial burden. Fishing is the primary source of income for approximately 14.5 million fishermen in India (11). The fishing sector accounts for around 4.5 million metric tonnes of fish, representing forty percent of the overall fish output (Ibid). Kerala's fishermen population stood at 8, 04,165, of which 4,31,447 are male and the remaining 3,72,718 are female. According to the report, all these fishermen from Kerala is engaged in this profession as full time workers. The state's marine fisheries industry has grown dramatically as a result of fisheries-friendly government regulations, well-developed harvest and post-harvest infrastructure, and rising demand for seafood in both local and export markets. Kerala has been in the forefront of incorporating creative and new technology into fishing practises, and the adoption of these technologies has resulted in a complicated framework for marine fisheries (12). The primary objective of this study is to assess the availability, accessibility, and utilization of healthcare services among coastal fishermen in two selected districts of Kerala—Kannur and Alappuzha. The study seeks to identify and analyze disparities in healthcare infrastructure, service usage patterns, and health outcomes between these two districts.

Specifically, the study aims to:

- Evaluate the level of access to public and private healthcare services in both districts.
- Assess the prevalence of lifestyle-related diseases among the fishing communities.
- Examine the relationship between healthcare accessibility and socio-economic factors using the Multidimensional Poverty Index (MPI).
- Compare healthcare utilization behaviourand preferences using statistical tools, including ANOVA.

Based on these objectives, the following guiding research questions are formulated:

RQ1: How does the accessibility to healthcare services differ between Kannur and Alappuzha?

RQ2: What are the primaries factors influencing the choice between public and private healthcare facilities among fishermen?

RQ3: What is the association between multidimensional poverty and healthcare utilization in the study areas?

RQ4: Are there statistically significant differences in healthcare access and disease prevalence between the two districts?

This study examines the healthcare options provided to coastal fishermen in Kerala, India, with a particular focus on two chosen districts: Kannur and Alappuzha. Both areas have strong maritime histories and contain lively fishing towns that are essential to the local economy and culture.Kannur District in the northern region of Kerala is well-known for its long coastline and successful fishing sector. The Puthiyangadi fishing village, chosen as a case study location, illustrates the distinctive socio-economic characteristics of coastal communities. The village is defined by its tight-knit community, dependence on traditional fishing methods, and the difficulties brought about by modern development pressures. Gaining insight into healthcare access and usage patterns in Puthiyangadi will offer valuable understanding of the health needs and obstacles experienced by local fishermen and their families. Alappuzha District also referred to as the "Venice of the East,"

is famous for its extensive system of waterways and serves as an important center for fishing operations. The Thumboli (South) fishing village was selected for this research because of its advantageous location and the varied demographic makeup of the people living there. This town combines both traditional and modern fishing methods, with differing levels of healthcare access impacted by socio-economic conditions. Examining healthcare access in Thumboli will shed light on the obstacles and support systems accessible to the fishing population in this area.

Kannur and Alappuzha were purposively selected for this study due to their contrasting geographical features, healthcare infrastructure, and socio-economic profiles among coastal districts of Kerala. Kannur, located in the northern region, is characterized by better healthcare accessibility and infrastructural development; whereas Alappuzha, in the south-central part of the state, has a unique network of inland waterways and faces documented challenges in healthcare access. Both districts also represent substantial populations engaged in marine fishing, yet differ in poverty levels and health outcomes, providing a comparative framework to analyze disparities in healthcare access and utilization. The contrast between these two regions offers valuable insights into how location-specific factors influence the health status of fisherfolk. The geographic layout of the two districts plays a critical role in shaping healthcare accessibility. Alappuzha, often referred to as the "Venice of the East," is crisscrossed by a dense network of canals and inland waterways. This unique topography, while culturally and economically significant, also imposes spatial barriers to physical access, particularly in reaching healthcare centers during emergencies or monsoon seasons. In contrast, Kannur features more road-connected terrain with fewer natural barriers, facilitating relatively easier travel to healthcare facilities. These topographical distinctions influence not only the time and cost of accessing care but also affect the frequency of healthcare utilization and the choice between public and private services. A thorough understanding of these spatial dynamics is essential for designing targeted health interventions and infrastructure planning in coastal regions.

Methodology

Selection Method of Study Districts

Kannur and Alappuzha districts were selected using a purposive sampling method. This non-random approach was chosen to enable a comparative analysis of healthcare access and socio-economic conditions across two coastal districts that differ significantly in healthcare infrastructure, geographic characteristics, and levels of poverty among fishing communities. This selection strategy aligns with the study's objective to explore regional disparities and inform targeted policy recommendations.

Primary Data

This research involves gathering primary data using a combination of qualitative and quantitative methods to thoroughly evaluate the accessibility of healthcare services for coastal fishermen in specific districts of Kerala. The blending of these techniques results in a more intricate perception of the healthcare situation in these areas.

Sample Size

The study includes 90 participants in total, with 45 individuals from both Kannur and Alappuzha districts. This even-handed portrayal allows for comparison of healthcare accessibility and obstacles experienced by fishermen in each area.

Sampling Technique

A method of snowball sampling was utilized to locate and enlist subjects for the research. This method works well for reaching out to groups that are difficult to access, like coastal fishermen, who might not be found using traditional sampling techniques. The first individuals chosen to take part were those who showed interest in participating, and they then recommended other potential participants, creating a recruitment chain in the fishing neighbourhoods.

Data Collection Tool

The main instrument utilized for data collection was a structured questionnaire created to acquire both qualitative and quantitative data. The survey contained closed questions to measure healthcare access, like how often healthcare is used, obstacles perceived, and service availability. Furthermore, open-ended questions were included to gather participants' personal experiences, opinions, and cultural beliefs about healthcare.

Tool Validation and Piloting

To ensure clarity, reliability, and contextual relevance, the structured questionnaire was subjected to a pilot study involving a small group of 10 fishermen—five from each district—not included in the final sample. Feedback from this pilot was used to refine the language, adjust ambiguous questions, and ensure cultural appropriateness. The revised tool was then reviewed by subject experts in public health and social sciences to confirm its content validity before formal data collection began.

Nature of the Study

The study is characterized by its descriptive approach, which centers on deriving conclusions straight from the interview responses of the participants. The research aims to offer a comprehensive view of healthcare access among fisher folk in Puthiyangadiand Thumboli through systematic data analysis.This study will use two main analytical methods to analyze healthcare access among coastal fishermen in certain districts of Kerala: the Multidimensional Poverty Index (MPI) and Analysis of Variance (ANOVA). These instruments will assist in evaluating the socio-economic background of the participants and contrasting healthcare accessibility across various demographics.

Dependability and Inter - Rater Agreement

To enhance the dependability of the qualitative data analysis, a subset of open-ended responses was independently reviewed and coded by two researchers. An inter-rater agreement process was conducted to compare the coding results. Discrepancies were discussed and resolved through consensus, and the coding framework was refined accordingly. This process helped ensure consistent interpretation and reliability of the qualitative findings.

Tools for Analysis

The Multidimensional Poverty Index is a thorough indicator that expands beyond just income to evaluate poverty in different areas such as health, education, and living conditions. This study is especially important because it gives a glimpse into the socio-economic situations of the fishing communities in Kannur and Alappuzha.

Elements of MPI: The MPI consists of various measures within three different aspects.

Health: The mortality rate of children and their nutritional status.

Education refers to the period of time spent in school and the act of regularly attending school.

Quality of life: Availability of fresh water, hygiene, power supply, home conditions, and possession of assets.

The MPI will be utilized to assess the prevalence and severity of poverty among participants in both Puthiyangadi and Thumboli. Through determining the MPI, the research can offer a detailed insight into the impact of multidimensional poverty on healthcare access and utilization among fishermen. The results may emphasize the differences in poverty rates in the two areas, providing additional context to healthcare obstacles.

ANOVA involves the examination of variance. ANOVA is a statistical technique for comparing means across multiple groups to ascertain if there are noteworthy discrepancies among them. It is especially beneficial for examining variations in healthcare access depending on different socio-economic factors in this study. One-Way ANOVA is employed for comparing healthcare access across different districts, using only one categorical variable (i.e, district). The ANOVA will assist in comparing the means of healthcare access indicators (such as how often healthcare visits occur and perceived obstacles to access) among fishermen in Kannur and Alappuzha. By testing the statistical significance of mean differences, the research can make assessments about the quality of healthcare services in different districts and pinpoint particular areas needing enhancement.

In conclusion, integrating the Multidimensional Poverty Index with Analysis of Variance will offer a strong structure for studying healthcare availability among coastal fishermen. The MPI will provide insight into the social and economic conditions and poverty rates in the communities, while ANOVA will enable a thorough comparison of healthcare accessibility among various groups. These tools will help the study reveal important insights that can guide specific interventions and policy suggestions for enhancing healthcare access for fishermen in Kerala.

Results and Discussion

Demographic Characteristics

Table 1 offers an in-depth examination of the demographic features of fisher folk communities in

Kannur and Alappuzha, two districts in India. The information is classified according to four main factors: age, religion, type, and educational background.

Table 1: Demographic Characteristics of the Samples

Age Wise Distribution of the Samples		
Age	**Fishermen Population (Kannur)**	**Fishermen Population (Alappuzha)**
Less than 40	26.67	17.78
40 to 50	44.44	24.44
50 to 60	22.22	44.44
More than 60	6.67	13.33
Religious Distribution		
Religion	Fishermen Population (Kannur)	Fishermen Population (Alappuzha)
Hindu	53.33	77.78
Muslim	36.67	13.33
Christian	10	8.89
Category Wise Data		
Category	Fishermen Population (Kannur)	Fishermen Population (Alappuzha)
General	-	6.67
OBC	46.67	33.33
OEC	40	60
SC	13.33	0
Educational Qualification		
Education	Fishermen Population (Kannur)	Fishermen Population (Alappuzha)
Primary	-	53.33333
High School	46.67	26.66667
Higher Secondary	36.67	20
Higher Education	16.67	0

Age: The age distribution of fishermen in both districts is heavily tilted towards the older age categories. In Kannur, 44.44% of fishermen fall within the age range of 40 to 50, whereas in Alappuzha, the same percentage of fishermen is aged between 50 and 60. This shows that a significant number of fishermen in both areas are in the peak of their professional careers.

Religion: The religious makeup of the fishing communities in Kannur and Alappuzha varies significantly. In Kannur, the majority consists of Hindus at 53.33%, with Muslims following closely at 36.67%. Nevertheless, in Alappuzha, the Hindu population makes up a much larger percentage at 77.78%, while Muslims and Christians are smaller minority groups.

Category: The table also offers information regarding the social classification of the fishermen. In Kannur, the OBC (Other Backward Class) category is the most dominant, comprising 46.67% of the population. In Alappuzha, the OEC category remains the primary group, making up 60% of the fisher population.

Education Level: The level of education among fishermen in both districts is comparatively low. In Kannur, the majority of fishermen have completed primary education, with a similar percentage found in Alappuzha at 53.33%. A smaller percentage have finished high school or received a higher level of education.

Basic Facilities of the Households

Table 2 presents a comparison of household facilities in Kannur and Alappuzha. Notably, while both districts report 100% access to basic infrastructure such as electricity, sanitation, and gas connections, Kannur shows a higher percentage of homeownership (91.11%) and vehicle ownership (100%), suggesting greater economic stability. In contrast, Alappuzha shows superior access to piped drinking water (100% vs. 73.33%), possibly due to its unique waterway system. These disparities reflect the regional infrastructural and geographic differences that influence healthcare accessibility and decision-making.

Table 2: Status of Essential Facilities

Facilities	Status of Facilities Available	
	Kannur (In %)	Alappuzha (In %)
Own House	91.11	75.56
Piped Drinking Water	73.33	100.00
Electricity	100.00	100.00
Sanitation	100.00	100.00
Gas Connection	100.00	100.00
Separate Kitchen	100.00	100.00
Own Shop	46.67	17.78
Fishing Boat	28.89	24.44
Fishing Net	86.67	80.00
Any Vehicles	100.00	71.11
Own Jewels	80.00	66.67
Bank Account	100.00	100.00

Essential Services and Facilities

In Kannur, a greater proportion of households (91.11%) own their homes as opposed to Alappuzha (75.56%). Although both districts have high access to piped drinking water, Alappuzha has a slightly higher percentage (100.00%) than Kannur (73.33%). Both areas have full access to electricity, with a rate of 100%. Both areas also have complete access to sanitation facilities. Every residence in the two districts is equipped with gas connections. Each district has separate kitchens in every household.

Economic Infrastructure

A much larger proportion of households in Kannur (46.67%) own shops as opposed to Alappuzha (17.78%). Kannur has a slightly greater proportion of households with fishing boats (28.89%) when compared to Alappuzha (24.44%). Both areas have a large number of households that own fishing nets, with Kannur having a slightly higher percentage at 86.67% compared to Alappuzha's 80.00%. A greater proportion of households in Kannur (100.00%) possess a vehicle of any kind in comparison to Alappuzha (71.11%).

Assets and the Promotion of Financial Inclusion

Kannur has a higher percentage of households owning their own jewellery (80.00%) in comparison to Alappuzha (66.67%). Both areas have all households with bank accounts.

Both areas have good access to fundamental services such as electricity, sanitation, and gas connections. Kannur has a greater proportion of households who own their homes, businesses, and vehicles, indicating a slightly heightened level of economic involvement and ownership of assets. Both areas show a high percentage of individuals owning bank accounts, which demonstrates strong financial inclusion. These discoveries offer important understandings into the quality of life and financial situations of households in Kannur and Alappuzha. They have a range of uses, including policy creation, planning for growth, and exploring the socio-economic gaps between the districts.

Socio Economic Background of the Fisher Folk

Table 3 offers an in-depth examination of the fishermen's socio-economic status in Kannur and Alappuzha, two Indian districts, utilizing the Multidimensional Poverty Index (MPI). The MPI assesses poverty using ten indicators within health, education, and living standard dimensions.

Table 3: MPI-Based Socio-Economic Profile of Fisherfolk in Kannur and Alappuzha

Indicators	Sub Indicators	Deprived (%) - MPI (Kannur)	Deprived (%) - MPI (Alappuzha)	Sector Wise MPI (Kannur)	Sector Wise MPI (Alappuzha)
	Nutrition (1/6)	0.50	1.17		

Health	Child & Adolescent Mortality (1/12)	0.17	0.42	0.305555556	0.388888889
	Maternal Health (1/12)	0.25	0.33		
Education	Years of Schooling (1/6)	0.00	0.00	0	0
	School Attendance (1/6)	0.00	0.00		
		0.19	0.48		
	Cooking Fuel (1/21)				
	Sanitation (1/21)	0.00	0.00		
	Drinking Water (1/21)	1.00	1.71		
Standard of Living	Housing (1/21)	0.05	0.33	0.176870748	0.068027211
	Electricity (1/21)	0.00	0.00		
	Assets (1/21)	0.00	0.14		
	Bank Account (1/21)	0.00	0.00		
			Value of MPI	0.16	0.15
			Poverty based on MPI	16.08%	15.23%

Kannur's MPI of 0.16 is slightly higher than Alappuzha's 0.15. This means that a slightly higher percentage of people in Kannur are deemed multidimensional poor based on the MPI standards.

Health: Both areas show low health scores, pointing to a large part of the community dealing with health issues. Kannur's health MPI is 0.305555556, mainly influenced by mortality rates among children and teenagers. The health MPI of Alappuzha stands at 0.388888889, largely due to child and adolescent mortality.

Education: Both areas have attained full coverage in terms of years of education and school attendance, suggesting no notable deficiencies in these aspects.

Quality of Life: The indicators of quality of life display differences between the two districts. The level of living MPI in Kannur stands at 0.176870748, with housing and assets deficiencies being the primary factors. Alappuzha's MPI standard of living is 0.068027211, showing fewer deprivations in this aspect than Kannur.

Alappuzha's MPI is lower than Kannur's, indicating a lower extent of multidimensional poverty. Both areas experience comparable health challenges, with a focus on child and adolescent mortality as a significant worry. Both areas have accomplished providing education to everyone. Kannur experiences more housing and asset deprivations than Alappuzha.

The MPI underscores the necessity for focused actions to meet the specific requirements of the impoverished residents in both areas. These measures may center on enhancing health results, offering assistance for obtaining housing and assets, and guaranteeing that education is both accessible and tailored to the community's needs. The MPI data can be used to make policy decisions regarding reducing poverty, implementing social welfare programs, and promoting economic development. By identifying the unique aspects of poverty in these areas, policymakers can create better plans to tackle what leads to poverty and enhance the well-being of individuals.

Self-Assessment of Health

Self-evaluation of health involves an individual's assessment of their own health condition, typically done through subjective methods like surveys or questionnaires, Table 4. This idea holds importance in the field of public health studies as it can offer understanding on individuals' perspectives on their health and happiness, which may vary from medical evaluations. Numerous research efforts have emphasized the importance of self-evaluation in determining health results. Recent study show that self-reported health is a dependable sign of health condition and can forecast death, regardless of other health assessments (13).

Table 4: Self-Assessment of Health

Health Status	Kannur (%)	Alappuzha (%)
Poor	36.67	57.78
Satisfactory	46.67	33.33
Good	16.67	8.89

The comparison table shows the self-evaluated health status of fishermen in Kannur and Alappuzha, two regions in India. The information is displayed in percentages, showing the percentage of fishermen in each area who rated their health as "Poor," "Satisfactory," or "Good." A much larger proportion of fishermen in Alappuzha (57.78%) reported their health as "Poor" in comparison to Kannur (36.67%). In Kannur, a higher percentage of fishermen (46.67%) rated their health as "Satisfactory" compared to Alappuzha, where only 33.33% did so. Alappuzha had a slightly lower percentage (8.89%) of fishermen rating their health as "Good" compared to Kannur (16.67%), with a smaller overall percentage in both districts. The fishermen in Alappuzha had a notably higher rate of poor health than those in Kannur. More fishermen in Kannur rated their health as satisfactory compared to those in Alappuzha who reported poor health. In general, fewer fishermen in each district described their health as good. Different reasons, like living conditions, job risks, healthcare access, and lifestyle choices, could explain why a greater number of fishermen in Alappuzha are reporting health issues. The information indicates that fishermen in Kannur typically believe they are in better health than those in Alappuzha. More investigation is necessary to comprehend the root causes of this discrepancy.

Prevalence of Life Style Diseases among the Fisher Folk

The high occurrence of lifestyle-related illnesses among fishermen is a significant issue in public health, given their distinct socio-economic circumstances and health obstacles (Table 5). There is a growing awareness of lifestyle diseases like heart diseases, diabetes, obesity, and respiratory conditions in populations that were previously thought to be very active. Research has shown an increasing occurrence of lifestyle diseases among fishing communities. In coastal areas, studies have found that fishermen have higher rates of hypertension, diabetes, and other metabolic disorders than the general population (14).

Table 5: Prevalence of Life Style Diseases

Diseases	Kannur (%)	Alappuzha (%)
Heart Disease	13.33	8.89
Obesity	13.33	17.78
Diabetes	73.33	42.22
Stroke	6.67	4.44
Hypertension	63.33	48.89
Chronic Obstructive Pulmonary Diseases	26.67	22.22
Osteoporosis	56.67	37.78

The table compares the occurrence of different lifestyle diseases among fishermen populations in Kannur and Alappuzha, two districts in India. The information is displayed in percentages, showing the percentage of fishermen in each area who mentioned having each illness. A larger proportion of fishermen in Kannur (13.33%) experienced heart disease in comparison to those in Alappuzha (8.89%). A greater proportion of fishermen in Alappuzha (17.78%) were found to be obese compared to those in Kannur (13.33%). A much larger proportion of fishermen in Kannur (73.33%) have diabetes in comparison to Alappuzha (42.22%). Kannur had a greater proportion of fishermen (6.67%) reporting stroke than Alappuzha (4.44%). More fishermen in Kannur (63.33%) had hypertension in comparison to those in Alappuzha (48.89%). In Kannur, a larger proportion of fishermen (26.67%) reported COPD than in Alappuzha (22.22%). Kannur had a greater proportion of fishermen (56.67%) with osteoporosis than Alappuzha (37.78%).

As detailed in Table 5, the incidence of lifestyle diseases varies significantly between districts. Diabetes and hypertension are markedly higher in Kannur (73.33% and 63.33%, respectively) than in Alappuzha (42.22% and 48.89%), indicating more chronic health burdens in Kannur. These results align with MPI findings that show higher multidimensional poverty in Kannur, suggesting a link between economic deprivation and chronic disease prevalence.

The occurrence of all the mentioned lifestyle illnesses is greater in Kannur than in Alappuzha. The largest variation can be seen in the rates of diabetes, with a significantly higher proportion of fishermen in Kannur experiencing this condition. In Alappuzha, obesity rates are a bit higher, while in Kannur, rates of heart disease, stroke, hypertension, COPD, and osteoporosis are higher. Various factors, including dietary habits, physical activity levels, stress levels, access to healthcare, and genetic predisposition, could be contributing to the higher prevalence of lifestyle diseases in Kannur. The increased incidence of diabetes in Kannur could be attributed to genetic factors, dietary habits, or lifestyle factors unique to the area. More research is required to comprehend the reasons behind the variations in lifestyle disease prevalence in both districts.

Access to Medical Facility by Households

Having access to medical facilities significantly impacts the health outcomes of vulnerable populations like fisher folk in Kerala (Figure 1). This population encounters distinct obstacles in obtaining healthcare facilities because of socio-economic, geographic, and cultural elements. A large number of fishing families faced obstacles in accessing healthcare, such as financial limitations, absence of local medical centers, and a preference for traditional healing methods.

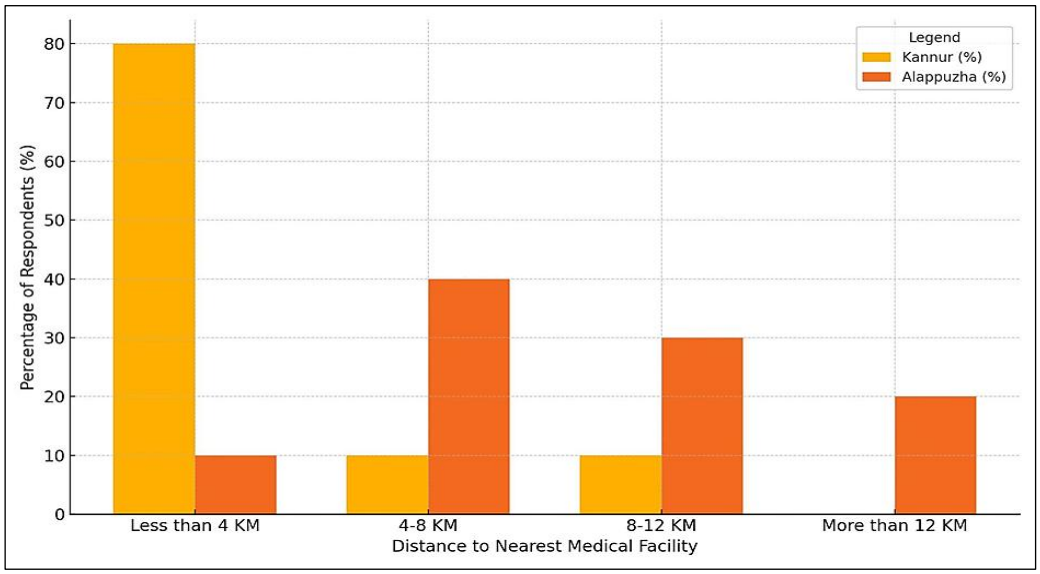

Figure 1: Distance to the Nearest to Medical Facility

As shown in Figure 1, the bar graph shows how far fishermen in Kannur and Alappuzha, two districts in India, are from the closest medical facility. The information is displayed in percentages, showing the percentage of fishermen in each area who reside at various distances from the closest healthcare facility. In Kannur, a much larger proportion of fishermen (80%) reside within a distance of 4 kilometers from the closest medical centre in comparison to Alappuzha (10%). A greater proportion of fishermen in Alappuzha reside 4-8 kilometers (40%) and 8-12 kilometers (30%) away from the nearest medical facility than those in Kannur. A smaller proportion of fishermen in Kannur reside 4-8 kilometers away (10%) and 8-12 kilometers away (10%) compared to those in Alappuzha. In Alappuzha, only 20% of fishermen reside more than 12 kilometers away from the closest medical facility, compared to Kannur where 0% fall into this category. Most fishermen in Kannur have convenient access to healthcare, with a large proportion residing within a 4-kilometer radius. A higher percentage of fishermen in Alappuzha reside 4-8 kilometers and 8-12

kilometers away from the closest medical facility, showing reduced access. Just a few fishermen in Alappuzha reside over 12 kilometers away from the closest medical centre. Thus, Figure 1 illustrates the geographic disparity in access to medical facilities. A substantial 80% of Kannur fishermen live within 4 km of a healthcare center, while only 10% of Alappuzha's do. This indicates a critical infrastructure gap in Alappuzha, which may contribute to their increased use of private hospitals despite economic limitations, as further analyzed in Figure 2. Improved access to healthcare services in Kannur can be credited to reasons like a more extensive network of medical facilities, improved transportation systems, or reduced population density. The reduced availability of medical services in Alappuzha could be a result of fewer healthcare facilities, limited transportation choices, or a denser population. Proximity to the closest medical centre can greatly affect healthcare accessibility, particularly for emergencies or chronic illnesses needing regular care.

ANOVA for Comparing Means

Fisherfolk usually operate in difficult conditions with fluctuating earnings, temporary jobs, and significant occupational hazards (15). It is crucial to comprehend the differences in access to medical facilities in various districts as these factors can worsen health vulnerabilities. Kerala, recognized for its advanced health strategies and relatively good human development measures, continues to show differences in healthcare availability within its coastal regions.

This research focuses on fisherfolk in different districts of Kerala to analyze their access to the closest medical facility. The study uses a one-way ANOVA to determine if there are notable variations in healthcare accessibility across districts and to explore how these variances affect health results (Table 6). Selecting districts with a range of socio-economic conditions for this research enables a detailed examination of how healthcare accessibility is influenced by specific factors in the area.

Table 6: ANOVA Results on Healthcare Access across Districts

Sample Areas	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	11.712	3	3.904	31.120	.000
Within Groups	10.788	86	.125		
Total	22.500	89			

Total of Squared Values: Among the districts, there is variability in access to medical facilities, as shown by the Between Groups value of 11.712. A greater total of squares indicate significant disparities in access between the groups. Within each district (10.788), this value indicates the diversity in access. It shows the variation in individual scores within a group. Total variability, equal to 22,500, is the sum of the between-groups and within-groups sums of squares in the data. It merges the differences seen among the groups and within each group.

Mean Square: Between Groups (3.904): This figure is calculated by dividing the sum of squares among groups by the number of groups it represents (11.712 / 3). It shows the typical fluctuation caused by variations among districts.

Within Groups (0.125): To find this, divide the within group sum of squares by its degrees of freedom (10.788 divided by 86). It shows the typical range of differences in each area.

F Statistic: The value of the F-Statistic is 31.120. The ratio of the average variation among groups to the average variation within groups is 3.904 divided by 0.125. A large F-value (31.120) shows that the difference among group means is much greater than the difference within groups. This indicates compelling proof of disparities in availability of healthcare services among the various districts.

Significance (p-value or Sig., 0.000): This value represents the likelihood of seeing an F-statistic as unusual as, or more unusual than, the one calculated, given that the null hypothesis holds true (which asserts that there are no disparities in access to medical services across the districts). A p-value of 0.000 (often shown as <0.001) implies that there is a statistically significant variation in access between districts.

Utilization of Medical Facilities by the Samples

The use of healthcare services by fishermen in Kerala is affected by different factors such as

access to medical facilities, socio-economic status, and cultural values, Figure 2. This group typically depends on a combination of public and private healthcare services like Primary Health Centres (PHCs), district hospitals, and private clinics. Fishermen depended on primary health centres for fundamental health requirements, but there was a clear shift towards utilizing private clinics for severe health conditions. This pattern emphasizes the two issues of healthcare being accessible and affordable.

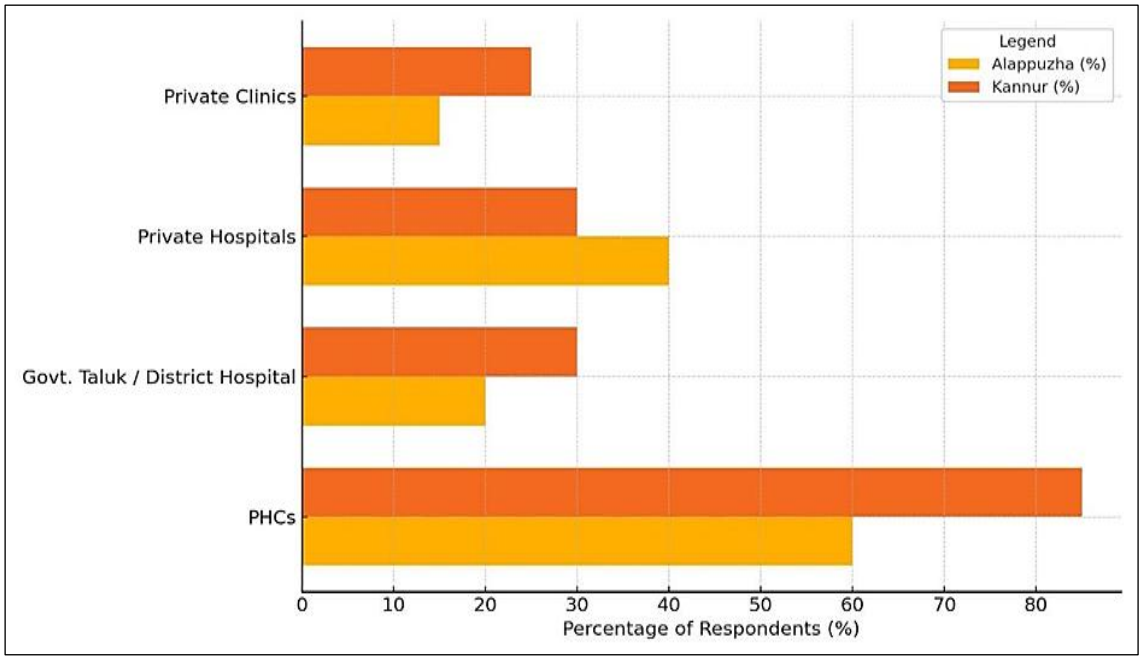

Figure 2: Utilization of Medical Facilities

The bar chart in Figure 2 illustrates the utilization of different types of medical facilities by fishermen populations in Kannur and Alappuzha, two districts in India. The data is presented as percentages, indicating the proportion of fishermen in each district who utilized each type of medical facility. A significantly higher percentage of fishermen in Kannur (80%) utilized PHCs compared to Alappuzha (60%). A slightly higher percentage of fishermen in Kannur (30%) utilized government taluk/district hospitals compared to Alappuzha (20%). A higher percentage of fishermen in Alappuzha (40%) utilized private hospitals compared to Kannur (30%). A higher percentage of fishermen in Kannur (25%) utilized private clinics compared to Alappuzha (15%).PHCs are the most utilized type of medical facility in both districts, but significantly more so in Kannur. Government taluk/district hospitals are utilized to a lesser extent in both districts. Private hospitals and clinics are utilized more frequently in Alappuzha compared to Kannur. The higher utilization of PHCs in Kannur could be attributed to factors such as a denser network of PHCs, better accessibility, or lower costs compared to other types of facilities. The higher utilization of private hospitals and clinics in Alappuzha might be due to factors such as a higher perceived quality of care, better amenities, or greater convenience. The choice of medical facility may also be influenced by factors such as the type of illness, the severity of the condition, and the financial ability of the fishermen.

Preference in Medical Consultation

The choice of seeking medical advice by fishermen in Kerala is influenced by multiple factors like cultural beliefs, financial factors, ease of access to medical facilities, and past interactions with healthcare professionals (Figure 3). Recognizing these choices is essential for customizing healthcare services for this distinct group. Fishermen rely on public health services for minor illnesses, but show a preference for private healthcare for major issues, seeking faster and more customized treatment (16).

The bar graph in Figure 3 shows the choice of medical consultation among fishermen in Kannur and Alappuzha, two Indian districts. The information is shown in percentages, showing the percentage of fishermen in each area who choose

to see a doctor right away, at their leisure, or not at all.In Alappuzha, 50% of fishermen prefer seeking immediate medical consultation, which is a significantly higher percentage than in Kannur, where only 30% opt for the same. In Kannur, 50% of fishermen prefer leisurely medical consultation, which is slightly higher than the 40% in Alappuzha. In Kannur, 20% of fishermen choose not to see a doctor at all, which is a higher percentage than in Alappuzha, where only 10% make the same choice. Fishermen in Alappuzha are more inclined to promptly seek medical help in comparison to those in Kannur. A greater number of fishermen in Kannur opt for a more relaxed approach to medical appointments. A lower proportion of fishermen in each area choose not to seek medical advice from a doctor. The greater preference for prompt medical care in Alappuzha may be due to different reasons like a heightened perceived necessity for medical treatment, improved availability of healthcare services, or varying cultural norms in seeking medical help. The increased preference for relaxed discussion in Kannur may be a result of reasons like reduced perceived requirement for healthcare, restricted availability of medical facilities, or cultural views on taking care of oneself. Factors like cultural beliefs, fear of medical procedures, or financial constraints could contribute to the preference of avoiding consulting a doctor completely.

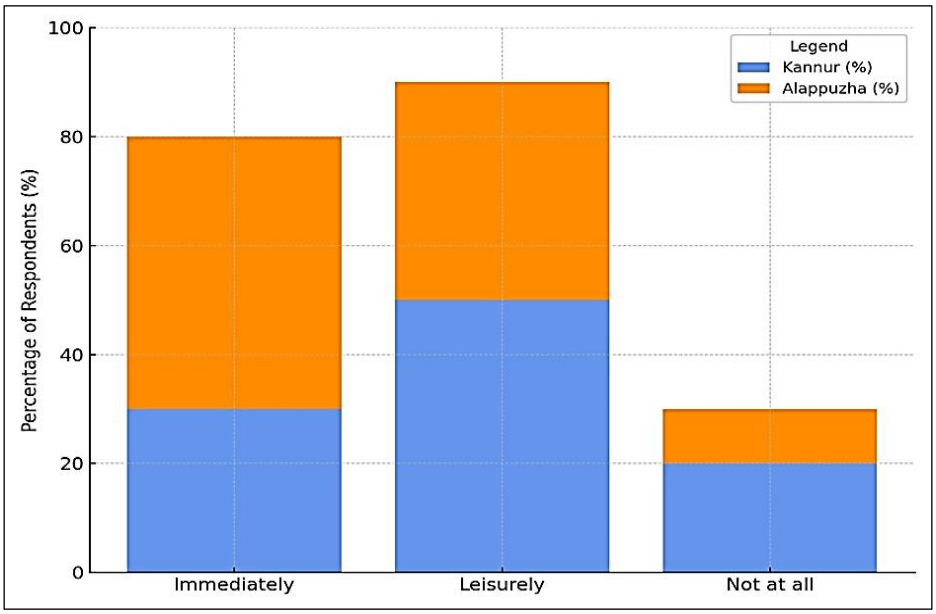

Figure 3: Preference in Medical Consultation

Conclusion

This research intended to explore the healthcare options accessible to coastal fishermen in chosen regions of Kerala. By conducting empirical research, the study found major differences in the availability and use of healthcare services in Kannur and Alappuzha districts. Kannur showed better access to medical facilities, as a larger number of fishermen lived near primary healthcare centres. However, Alappuzha showed a more scattered layout of healthcare facilities, resulting in longer distances for a lot of fishermen to travel. Although PHCs were the most widely used medical facilities in both areas, Kannur had a higher overall utilization rate. On the other hand, Alappuzha showed a stronger inclination towards private hospitals and clinics, indicating a possible preference for specialized care or higher quality services. The research revealed differences in the occurrence of lifestyle illnesses in the two regions. Kannur had elevated levels of diabetes, hypertension, and osteoporosis, whereas Alappuzha showed a slightly increased incidence of obesity. These results emphasize the importance of implementing focused strategies to tackle distinct health issues in every region. Fishermen in Alappuzha showed a greater inclination towards seeking immediate medical help, while fishermen in Kannur tended to take a more relaxed approach. This discrepancy indicates different views on healthcare needs and urgency. It is important for the government to focus on setting up more primary healthcare centers and mobile

medical units in regions with limited medical access, particularly in Alappuzha. Improving transportation infrastructure and community health worker programs can increase access to healthcare services for fishermen in both areas. Focused health education initiatives and interventions based in the community are vital in tackling the common lifestyle diseases in both areas. Specialized healthcare services, such as mental health and occupational health, need to be extended in order to meet the unique needs of fishermen. Government funding or insurance programs can ease the financial strain of healthcare costs for fishermen.

One key limitation of this study is the absence of a gender-disaggregated analysis. Although the study focused on male fishermen due to their primary role in the occupation, it is important to acknowledge that women in fishing communities may face distinct healthcare challenges, especially in areas such as reproductive health, maternal care, and access to gender-sensitive services. Future research should incorporate the voices and experiences of women in these communities to provide a more comprehensive understanding of health disparities and inform more inclusive policy interventions.

The study primarily utilized descriptive statistics, the Multidimensional Poverty Index, and one-way ANOVA to compare district-level differences in healthcare access and health outcomes. While one-way ANOVA was effective in highlighting inter-district disparities, the study did not apply inferential statistical techniques—such as correlation, regression, or multivariate analysis—that could examine specific relationships between key variables (e.g., distance to medical facility and frequency of healthcare visits, or poverty level and disease incidence) or control for multiple influencing factors simultaneously. The inclusion of such methodologies—such as logistic regression or multivariate analysis of variance (MANOVA)—would provide deeper insights into the causal or associative patterns affecting healthcare utilization. Employing these advanced statistical tools in future research would enhance the understanding of how various socio-economic and spatial factors interact and influence health behaviors, thereby supporting the development of more precise and effective policy interventions.

Abbreviation

None.

Acknowledgement

None.

Author Contributions

All authors have equally contributed.

Conflict of Interest

The authors declare no conflict of interest.

Ethics Approval

Ethical clearance for this study was based on the provision of informed consent from all participants, ensuring their voluntary participation and understanding of the research's purpose and procedures.

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