

# Deeper Insight Into The Demographic And Health Profile Of The Blocks Of Ri Bhoi, Meghalaya: A Cross Sectional Study

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## Abstract:

**Background:** Ri Bhoi district in Meghalaya, a hilly tribal enclave dominated by matrilineal Khasis, grapples with a dual disease burden amid rural ecology and cultural practices like arecanut chewing and smoked meat diets. Infections from monsoon streams and NCDs—hypertension, diabetes, oral cancers—prevalent due to betel quid, alcohol, and tobacco, heighten maternal-child risks despite strong UIP vaccinations. This cross-sectional survey assessed lifestyle, sanitation, diseases, contraception, and immunization in 316 households to gauge quality-of-life and mortality indices.

**Methods:** Conducted over one month in Physiology Department, P.A. Sangma International Medical College, post-ethical clearance, the study surveyed 1,919 individuals (683 males, 784 females, 452 children <12 years) across Baridua, Jorbil, Umsning, Jirang, Umling, and Nongpoh in Ri Bhoi. Standardized questionnaires elicited data on habits, hygiene, health complaints, family planning, and vaccination status from semi-rural households featuring gardens, poultry, and matrilineal finances. Analysis used MS-Excel. **Results:** Literacy stood at 70%; diets were 99% non-vegetarian (Khasi 96.5%, Christian 95.2%). Age peaked at 30-60 years; families averaged 3-6 members. Sanitation excelled (95.6% toilets), but waterfalls fuelled diarrhoea (512 cases: 17% males, 12% females, 66% children) and respiratory infections. Dermatoses hit 20% females, 64% children; NCDs included hypertension (19.6% males, 18.7% females), diabetes (9-11%), cancers (1-1.5% neck/stomach), and alcohol use (594 males, 465 females). ASHA/ANM dominated care; primigravidae ANC 63%, child vaccination 99%, but maternal gaps persisted.

**Discussion:** Findings echo Meghalaya's epidemiological shift: receding infections versus NCD surges from arecoline-DNA damage, PAHs, and ALDH2 variants, amplified by low awareness despite literacy gains. High sanitation reflects Swachh Bharat, yet hygiene lapses and PHC bypass signal cultural barriers. **Conclusion:** Targeted ASHA-led NCD screening, betel cessation, and water safety promise morbidity compression, aligning with SDG 3 in tribal Northeast India.

**Keywords:** Khasi tribe, NCDs, arecanut chewing, child vaccination, epidemiological transition

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## Introduction

Ri Bhoi district, established in 1996 from East Khasi Hills, encompasses 2,448 sq km of Meghalaya's hilly plateaus at 800-1,500m, featuring subtropical forests, cascading waterfalls, and fertile betel-areca groves bordering Assam. Its terrain—rugged landscapes and river valleys—supports semi-rural economies in blocks like Umsning (141,000 pop.), Umling (87,000), and Jirang (31,000), with 579 villages blending thatched bamboo homes, pineapple orchards and small poultry farms.<sup>1</sup> Census 2011 tallied 258,840 residents (132,531 males, 126,309 females; sex ratio 953), projecting ~320,000 by 2025 amid 34% decadal growth; child (0-6)

share at 20% signals youthful vigour. Khasis (85-90%) uphold matrilineal society, boosting female workforce (74% literacy vs. 77% male, overall 76%), though 25% languish below poverty, fuelling migration.<sup>2,3</sup>

Health mirrors this ecology. Infections dominate wet seasons: ARIs, diarrhoea from untreated streams claim under-5 mortality at 32/1,000 (NFHS-5 uptick from 30); anemia hits 45% children, 54% women.<sup>4</sup> Dermatoses, scabies thrive in humid farms. NCDs surge via "tribal transition": hypertension ~25%, diabetes 12% state-wide (ICMR-INDIAB);<sup>5</sup> esophagus/oral cancers lead (39% mortality-incidence ratio, top-5 killer), from 90% arecanut chewing (arecoline-DNA damage), bidi (lung),

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smoked meats/liquor (PAHs, MASLD). Meghalaya's oral cancer rate: 35/100,000 males. <sup>6</sup>

Reproductively, fertility 2.9 (vs. India 2.0); 49% women get 4+ ANC (Ri Bhoi 61-64%), institutional deliveries 70%, but anemia (54%), home births (15%), contraception 45% persist; Vaccinations excel—UIP DPT3/measles 90-95%, full immunization 64% kids 12-23months—curbing polio, yet maternal/Tt gaps linger.<sup>7,8</sup>

PHCs, CHCs, ASHA anchor amid cultural delays (e.g., kymbat attributions). This context primes targeted inquiries into local burdens.<sup>9</sup> With this background this cross-sectional study was designed to have a deeper insight into specifically the factors which have an impact on the quality of life index as well as maternal and infant mortality index.

**Methods:** The study was carried out in the Department of Physiology of P A Sangma International Medical College. The study is a cross sectional study. Institutional ethical committee clearance was taken. Duration of the study was 1 month. Altogether, 316 households with 784 females and 683 were males 452 were children below the age of 12 years (of which 239 were girls and 193 were boys) were asked about their lifestyle, food habits, sanitary and waste disposal methods as well as various diseases they suffered from time to time alongwith the contraceptive methods used and vaccination status for self and children of the family in a standard questionnaire form which were used as a method of elicitation of history from the household members in Ri Bhoi District of Meghalaya.

The households were in Baridua, Jorbil and Upper Jorbil, Umsning, Jirang, Umling, Nongpoh locality of Ri Bhoi district. Most of the households were semi urban and rural types. Some of them had thatched roof with muddy floors and bamboo matrix walled. Almost all the households had plenty of greenery around and almost all the houses had their own garden which had vegetables and seasonal fruit trees like oranges, pineapples, guava and banana. Most of the households had poultry and also some domesticated to pet animals like goats, dogs, chicken and hen. Some of the places didn't have electricity supply still. The females of Ri Bhoi district were mostly employed and did manage the finances of the family with small scale trading and business ventures since the societal type of the Khasi tribes follows matrilineal family norms. The data were collected, accumulated and analysed in the Department of Physiology PA Sangma Medical College. The analysis of the data was done with the help of MS- Excel software.

**Results:** Out of 1919 persons interviewed for the health survey – 1421 were literate. The literacy rate being 70.03%. Dietary patterns of the 784 females 778 were non-vegetarian. The percentage being 99.23%. On a similar way, out of the 683 males 679 were non-vegetarian. The percentage being 99.41%. Most of the households 305 out of 316 households covered belonged to local khasi tribes and out of the remaining eleven 5 were Gorkhali (Nepali) households, 6 were Garo households. Majority of the populace followed Christianity as the religion 95.2% whereas rest 4.8% followed Hinduism as their religious belief.

Khasi is the main language spoken by the people surveyed 98% of the people, while Garo was spoken by 1.5% of the population, 0.5% had Gorkhali as their mother tongue.

The age wise population demography was variable with people mostly concentrated in 30-60 years of age of either gender.

Age group ( Years)	Male	Female
100 above	Nil	Nil
90-100	1	Nil
80-90	4	2
70-80	31	47
60-70	35	54
50-60	55	69
40-50	62	86
30-40	168	176
20-30	132	142
12-20	32	19
Less than 12	163	189

Table1: Showing the distribution of males and females as well as children in the survey

Most of the families had 3-6 members. The male members mostly did agriculture whereas females were equally working in fields as well as small industries out of the production of the crops. The children were carried along by the mother tied to their back when they went for work.

Sl. No	No. of Members	Households	Percentage
1	1-3	67	21
2	3-6	201	64
3	More than 6	48	15

Table 2: Number of members in households

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Amongst all the 316 household covered in the survey in Ri Bhoi district of Meghalaya, 302 had proper toilets and latrines and they had sewage tanks. The percentage being 95.6%. Only 3.4% households practised open defecation. As regards drinking water source is concerned, some had wells in their households, some had deep boring wells, others had supply water facilities at minimal pricing from the government sector. Some families even used the waterfall as their drinking source of water posing a threat to their health being easily prone to water borne diseases.

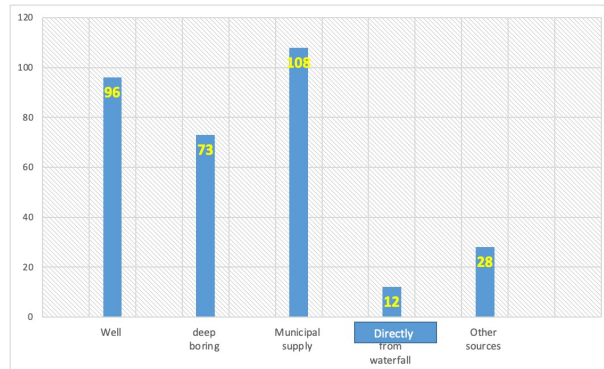


Fig1: Bar diagram depicting the drinking water source of the families in Ri Bhoi district

The general hygienic measures of the families living in households were not upto the mark as regards keeping themselves and their area clean that is personal, social, environmental, electronic and sleep hygiene were not upto the mark with lack of awareness about each of them thereby making them prevalent to all kinds of infectious and communicable diseases.

The most common health problems faced by the members were acute seasonal infections like fever with acute cold and cough giving rise to acute respiratory infections both upper and lower respiratory.

There were many cases of wintery diarrhoea. About 512 cases in total with males 115, females 97 & 300 children of the age group of less than 12 years were affected due to diarrhoea. The percentages of male female and children who were detected to be suffering from diarrhoea were 16.83%, 12.37% & 66.37% respectively.

Many inmates of the households also reported dermatological problems with acute dermatitis, dry skin, scabies, chronic dermatological infections. The percentage of males who had dermatological complaints was (56 out of 683) 8%, while in females it was a little more (159 out of 784), the percentage being 20.28% and 64% of children were having one or the other kinds of dermatological problems.

The number of persons (134 males and 147 females) was detected to be having hypertension and received monthly medication from local PHC's. The percentage of males affected are 19.6% whereas the females who were hypertensive were 18.7%.

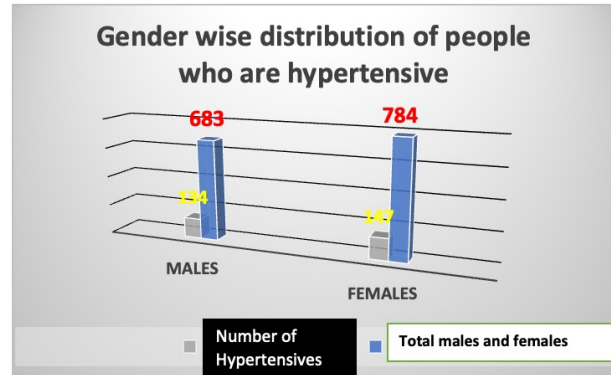


Fig2: Bar diagram depicting the number of hypertensive persons

As regards compliance and life style modifications were not followed well. Diabetes was also prevalent with 62 males and 88 females were affected with Type-2 DM with scanty knowledge of lifestyle modification and dietary regulations posing a great threat to them as regards development of the complications of diabetes particularly the macrovascular complications as diet was mostly animal protein based and consisted of smoked meat also in addition to taking meat almost on a regular basis. The percentage of persons with diabetes amongst males and females of Ri Bhoi district was around 9% and 11% respectively.

There were 14 persons (male) in different stage of neck cancer with lack of awareness amongst them of the disease as well as consumption of raw arecanut (called gowai) as well as different types of pan masala. Females were also affected by neck cancer 8 out of 784 (1%). The main point of concern was the lack of awareness about the disease and the apathy to get themselves treated. There were also other types of cancer prevalent particularly stomach cancer due to them consuming smoked food as well as rampant consumption of country made liquor. The percentage of males and females affected were 1% amongst males and 1.5% in females. Some isolated cases of breast carcinoma, and cervical carcinoma were reported by the women folk. There were some isolated cases of lung carcinoma as well in males as they smoked for long duration- mostly raw tobacco and tobacco leaves (bidis)

The household inmates also restored to alcohol intake with 594 of the males and 465 of the females takes

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alcohol (country made-local made) on a regular basis exposing them to the risk of NCD's like MASLD, CAD, HTN, diabetes, alcoholic liver diseases, cirrhosis and hepatocellular carcinoma.



Fig 3: Bar diagram depicting the persons consuming alcohol

The persons surveyed conveyed that when someone falls sick they usually report to ASHA/ANM with about 2% of the population report to PHC or Sub Center directly principally due to lack of awareness due to the complications posed by the different diseases.

In case of pregnant women, primigravidae usually report to the Primary health center or Sub Center as well as nearby government hospital for regular antenatal check-up (63%) whereas a small proportion of multigravidae (2%) report to the healthcare centers as there's a general feeling that they will go for home delivery by Dais/ASHA. The immunisation schedule of the gravid female is known and followed by a small section of the population only (2%).

The vaccination of the children under 12 years is being done for almost all children 448 of the 452 children (99.12%) received the doses under national immunisation schedule mainly due to the massive campaign done by the multipurpose community workers. The vaccines were mostly given in the nearby healthcare centers and primary health care center.

### Discussion:

#### Demographic and Socioeconomic Profile

The health survey in Ri Bhoi district, Meghalaya, paints a picture of a predominantly rural, tribal population rooted in Khasi culture. Out of 1,919 individuals interviewed across 316 households, 70.03% were literate, reflecting moderate education levels that likely influence health awareness. Nearly all respondents—99.23% of 784 females and 99.41% of 683 males—followed non-vegetarian diets heavy in animal proteins, including smoked meats, which aligns with local customs but raises

concern for chronic diseases. Most households (96.5%) belonged to the Khasi tribe, with smaller Garo (1.9%) and Gorkhali (1.6%) groups. Christianity dominated at 95.2%, shaping community norms around health and family.<sup>10</sup>

Age distribution skewed toward working adults (30-60 years), with 62 males and 86 females in the 30-40 bracket alone, underscoring a productive yet aging workforce vulnerable to lifestyle-related illnesses. Family sizes clustered at 3-6 members (64%), supporting agricultural livelihoods where men farmed and women balanced fieldwork with small-scale processing, often carrying young children—highlighting gender roles and child exposure to environmental risks.<sup>11,12</sup>

#### Hygiene, Water, and Sanitation Insights

Sanitation fared relatively well, with 95.6% of households equipped with toilets and sewage tanks, limiting open defecation to 3.4%—a positive outlier in rural Northeast India. Drinking water sources varied: household wells, borewells, government supplies, and risky waterfalls, the latter heightening waterborne disease susceptibility. Overall hygiene lagged—personal, environmental, and sleep practices were suboptimal—fostering infections amid low awareness.<sup>13</sup>

These patterns mirror regional challenges in Meghalaya, where tribal remoteness hampers infrastructure. High toilet coverage suggests successful interventions like Swachh Bharat, yet waterfall reliance evokes health threats seen in similar surveys, such as elevated diarrheal rates from contaminated sources.

#### Prevailing Health Issues and Risk Factors

Acute ailments dominated: seasonal respiratory infections (fever, cough) and winter diarrhoea afflicted 512 cases (16.83% males, 12.37% females, 66.37% children under 12), likely tied to poor hygiene and monsoonal climates. Dermatological woes—dermatitis, scabies—affected 8% males, 20.28% females, and 64% children, possibly from soil exposure in agriculture or crowded homes.<sup>14</sup>

Non-communicable diseases (NCDs) loomed large: hypertension hit 19.6% males and 18.7% females (134 and 147 cases), diabetes 9% males and 11% females (62 and 88), with poor lifestyle adherence exacerbating risks. Cancers were alarming—neck cancer from raw arecanut (gowai) and pan masala (1% males, 1% females), stomach from smoked foods and liquor, plus scattered breast, cervical, and lung cases linked to tobacco/bidi smoking.<sup>15</sup> Alcohol use pervaded (594 males, 465

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females), fuelling NCDs like MASLD, CAD, and cirrhosis.

Khasi diets, rich in betel nut and smoked meats, parallel Northeast India's high oral cancer rates—studies like the ICMR's National Cancer Registry report Meghalaya's incidence at 20-30 per 100,000, far above national averages. Non-veg dominance and alcohol echo metabolic risks, akin to NFHS-5 data showing 25-30% overweight in tribal areas, priming macrovascular complications.

### Healthcare Seeking and Preventive Gaps

Healthcare access leaned grassroots: most sought ASHA/ANM first, with only 2% going directly to PHCs due to unawareness of complications. Antenatal care was uneven—63% primigravidae attended PHCs, but multigravidae favoured home births (2% immunized), risking maternal morbidity.<sup>16</sup> Child vaccination excelled at 99.12% (448/452 under 12), crediting campaigns—a bright spot amid 2% maternal immunization compliance.<sup>17</sup>

These behaviors reflect cultural reliance on traditional dais over formal systems, compounded by remoteness. High child vaccination rates align with national immunisation schedule (UIP) successes in Meghalaya (95%+ coverage as per 2023 MoHFW), but adult NCD neglect signals needs for awareness drives.

### Conclusion:

This discussion on the Ri Bhoi health survey illuminates a classic epidemiological transition in a tribal enclave of Meghalaya: a receding tide of infectious diseases clashing with a rising NCD epidemic, framed by cultural and environmental determinants.

### Key Health Burden Synthesis

The survey's 1,919 participants reveal entrenched vulnerabilities. Acute infections—respiratory illnesses and diarrhoea (512 cases, disproportionately children at 66.37%)—stem from suboptimal hygiene and contaminated water like waterfalls, despite strong sanitation (95.6% toilet coverage). Dermatoses further burden females (20.28%) and children (64%), linked to various exposures. NCDs dominate long-term threats: hypertension (19-20%), diabetes (9-11%), and cancers (1-1.5%), propelled by betel quid (gowai),<sup>18</sup> smoked meats, alcohol (high male prevalence), and tobacco. These mirror Meghalaya's profile—ICMR data peg oral cancers at 20-30/100,000, exceeding India's 10/100,000, while NFHS-5 flags tribal overweight at 25-30%,<sup>19</sup> seeding metabolic havoc.

Demographics amplify risks: a 30-60-year bulge faces cumulative insults from non-veg diets and labour-intensive lives, with literacy (70%) curbing but not erasing unawareness. Furthermore, findings resonate with Northeast India's paradoxes.<sup>20,21</sup> Swachh Bharat boosted toilets, curbing open defecation (3.4%), yet hygiene lapses persist, evoking WHO estimates of 1.7 billion diarrheal episodes yearly in low-resource settings. UIP project is doing good with over 99% child vaccinated in contrast to maternal gaps (2% immunization), underscoring gender inequities—women working in fields alongside childcare, delaying her own care. ASHA/Dai's reliance (98%) as regards delivery of multigravida is an ominous sign but reveals PHC bypasses from complacency, a cultural holdover favouring dais.<sup>22</sup>

Risk factors are quintessentially Khasi chewing of arecanuts which has arecoline which may induce metaplasia and further malignancy via DNA alkylation.<sup>23</sup> Consumption of smoked foods incite gastric neoplasia due to liberation of polycyclic aromatic hydrocarbons. Also alcohol's acetaldehyde fuels MASLD/cirrhosis. This synergizes with genetic susceptibilities in matrilineal tribes as per genomic studies showing heightened aldehyde dehydrogenase 2 (ALDH2) variants.<sup>24</sup>

### Policy and Research Imperatives

To pivot, integrate NCD screening into ASHA routines—e.g., annual BP/glucose checks for hypertensive. Betel cessation via community outreach programmes, echoing Tamil Nadu's 30% quit rates.<sup>25,2</sup> Promoting balanced diets & health awareness against macrovascular risks thereby slight modification of the dietary habits from non-veg acceptance for lean proteins. Water chlorination campaigns can be targeted effectively which may potentially halve the diarrhoea.

Research-wise, cohort tracking of 316 households could quantify interventions, modelling attributable fractions (e.g., 40-50% oral cancers to betel, per IARC). Economic analyses justify scaling: NCDs cost India 1.5% GDP yearly (WHO).<sup>3</sup>

Ultimately, Ri Bhoi's story demands culturally attuned, multi-level action—empowering ASHA as NCD sentinels, destigmatizing screening, and weaving health into tribal ethos. Sustained efforts could compress morbidity, transforming this productive populace into a resilient one, aligning with SDG 3's equity mandate.

### Implications and Recommendations

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This survey underscores a dual burden: infectious diseases from hygiene lapses alongside NCD surges from betel, alcohol, and diets—threatening a demographic bulge in the age group of 30-60 years of age. Women's higher skin/diabetes burdens and child vulnerabilities demand targeted interventions. Strengths like sanitation and vaccinations offer leverage points.

Priorities should include betel cessation campaigns, hypertension/diabetes screening by ASHA and water safety education. Integrating NCD modules into immunization drives could boost compliance. Community-led hygiene workshops involving the local Khasi leaders, might bridge gaps. Longitudinal studies tracking interventions would refine strategies, curbing Meghalaya's NCD trajectory toward sustainable health equity.

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