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Biomedical Profile of Hemoglobin Level, Nutritional Status, and Blood Type in Community-Based Health Screening at Pematang Kamasan Posyandu

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ABSTRACT

Background: Community-based health screening is essential for the early detection of hematological abnormalities, nutritional disorders, and limited health awareness, particularly in rural populations with restricted access to routine medical services. **Objective:** This study aimed to describe hemoglobin levels, body mass index (BMI) status, blood type distribution, and community health knowledge among residents participating in Posyandu-based screening in Pematang, Kamasan Village. **Methods:** A descriptive observational study was conducted using secondary data from community health screening. Among 143 attendees, complete biomedical and knowledge assessment data were available for 45 participants. Variables included sex, hemoglobin level, BMI category, blood type, and awareness of personal blood type and hemoglobin status. Data were analyzed descriptively using frequency distribution, percentage, and mean ± standard deviation. **Results:** Female participants predominated in the screened population. Blood group O was the most common type, and obesity represented the dominant BMI category. Mean hemoglobin levels in both males and females were generally within normal physiological ranges. Despite measurable biomedical parameters, most participants were unaware of their personal blood type and hemoglobin status, indicating low community health literacy. **Conclusion:** This study demonstrates a coexistence of relatively normal hemoglobin status with high obesity prevalence and limited biomedical awareness in a rural community. Strengthening integrated community screening combined with targeted health education is necessary to improve preventive health behavior and reduce future cardiometabolic risk.

Keywords: Community Health Screening; Hemoglobin; Body Mass Index; Blood Type; Health Knowledge; Rural Population

INTRODUCTION

Community-based health screening plays an essential role in early detection of hematological abnormalities, nutritional disorders, and population health risks, particularly in rural settings with limited access to routine medical evaluation[1–3]. Basic biomedical parameters such as hemoglobin level, body mass index (BMI), and blood type distribution provide important information related to anemia risk, metabolic status, and genetic characteristics within a community. These indicators are widely used in preventive medicine to support early intervention and health promotion strategies[4–6].

Findings from community screening in Posyandu Pematang, Kamasan Village, revealed that the majority of participants were female, with blood type O being the most prevalent. Nutritional assessment indicated a predominance of obesity, while hemoglobin levels were generally within the

normal range, especially among female participants[7,8]. In addition, community knowledge regarding blood type and hemoglobin status remained notably low among nearly all respondents [9–11].

These results highlight a potential gap between biomedical health status and public awareness, which may influence long-term disease prevention efforts [12,13]. Despite the importance of community health screening, data describing integrated biomedical profiles combining hematological parameters, nutritional status, and knowledge level remain limited in rural Indonesian populations [14,15].

Therefore, this study aims to describe hemoglobin levels, BMI status, blood type distribution, and health knowledge among residents participating in Posyandu-based screening. Importantly, this study highlights a unique contribution by integrating biomedical parameters with community health literacy assessment in a rural Indonesian setting. This combined approach provides a more comprehensive understanding of community health status and addresses a gap in previous studies that often evaluate these components separately.

MATERIALS AND METHODS

Study Design and Setting

This study employed a descriptive observational design using secondary data derived from community-based health screening conducted at Posyandu Pematang, Kamasan Village. The screening activity included standard biomedical examinations and assessment of community health knowledge.

Participants

A total of 143 community members attended the Posyandu health screening. However, complete biomedical examination data including blood type, body mass index (BMI), hemoglobin level, and knowledge assessment were available for 45 participants, and these respondents were included in the biomarker analysis.

Data Collection and Variables

Data were obtained from routine screening measurements and structured knowledge assessment forms. All biomedical measurements were performed during the Posyandu screening using standard community health procedures (Figure 1). Hemoglobin levels were measured using a point-of-care testing (POCT) device. Body weight and height were measured using calibrated scales and stadiometers, and body mass index (BMI) was calculated as weight (kg) divided by height squared (m^2) and classified according to World Health Organization (WHO) criteria for adult populations. Blood type was determined using standard serological testing methods.

Health knowledge was assessed using a structured questionnaire consisting of dichotomous (yes/no) questions regarding participants' awareness of their personal blood type and hemoglobin status. Each correct response was assigned a score of 1, while incorrect or unknown responses were scored as 0. The total score was used to categorize participants into "aware" and "unaware" groups. The questionnaire was developed for community screening purposes and reviewed by medical personnel prior to implementation to ensure content relevance and clarity.

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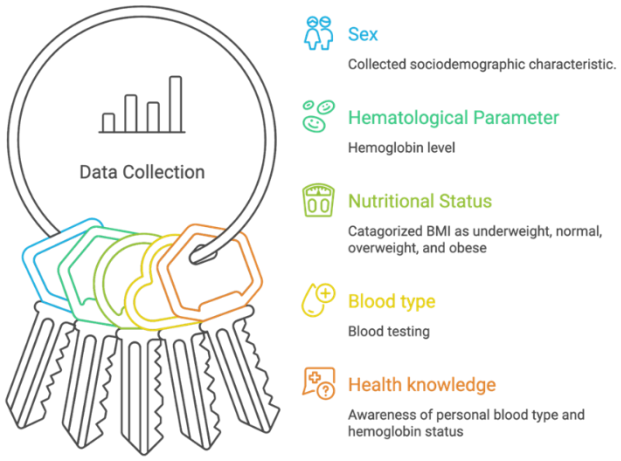

Figure 1. Overview of biomedical and knowledge variables measured during the Posyandu screening, including hemoglobin (point-of-care testing), body mass index (anthropometric measurement), blood type (serological test), and health knowledge (structured questionnaire).

Data Analysis

Data were analyzed descriptively using frequency distribution, percentage, and mean ± standard deviation (SD) to summarize participant characteristics, biomedical parameters, and knowledge levels. In addition to descriptive analysis, exploratory analysis was conducted to assess differences in hemoglobin levels between sexes and to observe potential associations between hemoglobin level and BMI categories. Results were presented in tabular and narrative form to describe the integrated biomedical profile of the screened population.

Ethical Consideration

This study used anonymized secondary data obtained from routine community health screening activities. Prior to participation, all participants provided informed consent during the screening process. All data were handled confidentially, and no personal identifiers were included in the analysis.

RESULTS

Participant Characteristics

A total of 143 community members attended the Posyandu health screening. The majority of participants were female (79.7%), while males accounted for 20.3% of the total population. Age distribution data were available for a subset of participants, indicating that a smaller proportion were aged below 30 years, whereas a larger group was older than 30 years.

These findings indicate that community health screening participation was predominantly driven by female individuals, with a relatively small proportion of male participants. The age distribution also suggests that most participants were adults over 30 years old.

Table 1. Participant Characteristics

Characteristic	Category	n	%
Sex	Male	29	20.3
	Female	114	79.7
Age (years)	< 30 years	9	6.3
	> 30 years	55	38.5

Availability of Biomedical Examination Data

Among the screened population, complete biomedical examination data including blood type, body mass index (BMI), hemoglobin level, and knowledge assessment were available for 45 participants, and these respondents were included in subsequent biomarker analysis. These findings indicate that the majority of participants were unaware of their personal blood type and hemoglobin status across both sexes, reflecting a low level of community health awareness.

Table 2. Availability of Biomedical Knowledge by Sex

Health Parameter	Sex	n	Aware n (%)	Unaware n (%)
Blood Type	Male	6	1 (16.67)	5 (83.33)
	Female	39	3 (7.69)	29 (92.31)
	Total	45	4 (8.88)	40 (91.12)
Hemoglobin Level	Male	6	0 (0.00)	6(100.00)
	Female	39	0 (0.00)	39 (100.00)
	Total	45	0(0.00)	45 (100.00)

Blood Type Distribution

The distribution of ABO blood groups among participants with complete data showed that blood type O was the most prevalent, followed by types B, A, and AB.

Nutritional Status Based on BMI

BMI assessment demonstrated that obesity was the dominant nutritional status, representing nearly half of the analyzed participants. Smaller proportions were categorized as normal weight, underweight, and overweight. Mean hemoglobin values varied across BMI categories.

Hemoglobin Profile

Hemoglobin evaluation showed that hemoglobin levels in both male and female participants were generally within normal physiological ranges. Exploratory analysis revealed that mean hemoglobin levels were higher in males compared to females, consistent with known physiological differences. Furthermore, no clear association was observed between hemoglobin levels and BMI categories, although some variation in mean values was noted across different BMI groups.

Community Knowledge of Blood Type and Hemoglobin

Knowledge assessment revealed that most respondents were unaware of their personal blood type and hemoglobin status, indicating a markedly low level of biomedical awareness in the screened community. The results show that blood group O was the most prevalent among participants, while obesity was the dominant BMI category. Hemoglobin levels were generally within normal ranges, with higher mean values observed in males compared to females.

Table 3. Blood Type Distribution, BMI status, and Hemoglobin Profile

Characteristic	Category	n	%	Mean ± SD
Blood Group	A	7	15.56	-
	B	11	24.44	-
	AB	4	8.89	-
	O	21	46.67	-
BMI	Underweight	5	11.11	15.36 ± 2.49
	Normal weight	13	28.89	20.62 ± 1.28
	Overweight	5	11.11	24.22 ± 0.26
	Obesity	22	48.89	28.85 ± 2.81
Hemoglobin Level	Normal Male	6	13.33	14.50 ± 1.08
	Normal Female	39	86.67	11.12 ± 0.58

DISCUSSION

This study described the integrated biomedical profile of community members participating in health screening at Posyandu Pematang, Kamasan Village. Among 143 screened individuals, only 45 participants had complete biomedical examination data, which were included in the biomarker analysis. The predominance of female participants observed in this study reflects typical participation patterns in community health services, where women are generally more engaged in preventive health activities[16,17]. Higher female participation has been widely reported in primary healthcare and community screening programs, often linked to maternal-child health services and stronger health-seeking behavior among women[18,19]. This pattern suggests that men may remain under-screened in community settings, indicating the need for targeted outreach strategies[20,21].

Regarding blood type distribution, this study identified blood group O as the most prevalent, followed by types B, A, and AB. This distribution is consistent with population patterns reported in many regions, where blood group O commonly predominates. Knowledge of blood type distribution is clinically relevant for transfusion preparedness, emergency care planning, and population genetics mapping at the community level [16–18]. The nutritional assessment revealed that obesity was the dominant BMI category among participants with complete data. This finding indicates a potential shift from undernutrition toward overnutrition in rural communities, reflecting broader epidemiological transitions associated with lifestyle change, reduced physical activity, and dietary modification. This finding suggests a potential nutritional transition in rural populations, where overnutrition is becoming more prevalent and may increase the risk of future cardiometabolic diseases[19,22–24].

Despite generally measurable hemoglobin values, this study found that community knowledge regarding personal blood type and hemoglobin status was markedly low. This gap between biomedical health status and public awareness is important because insufficient health knowledge may limit preventive behavior, delay healthcare utilization, and reduce the long-term effectiveness of screening programs[25–29]. Strengthening health education within Posyandu activities is therefore essential to ensure that screening outcomes translate into meaningful behavioral and clinical benefits[30–32]. Taken together, these findings emphasize the importance of integrated community health screening that combines biomedical measurement with educational intervention42. While the present study provides useful baseline information, its descriptive design restricts causal interpretation. A major limitation of this study is that only 45 out of 143 participants (31%) had complete biomedical examination data, which may raise concerns regarding representativeness. This incomplete data was primarily due to logistical constraints during community-based screening, including limited availability of measurement tools, time restrictions, and varying participant compliance.

This condition may introduce potential selection bias, as individuals with complete data could differ from those without complete measurements, for example in terms of health awareness or willingness to participate fully in examinations. As a result, the findings presented in this study may not fully reflect the overall characteristics of the screened population. Therefore, the results should be interpreted with caution and considered as preliminary findings. Future studies with more complete data coverage and improved data collection strategies are needed to enhance representativeness and strengthen the validity of conclusions.

CONCLUSION

This study provides an initial overview of the integrated biomedical profile of community members participating in health screening at Posyandu Pematang, Kamasan Village. The findings indicate a predominance of female participation, a higher prevalence of blood group O, a notable occurrence of obesity, generally normal hemoglobin levels, and low community awareness regarding personal blood type and hemoglobin status. However, given the limited number of participants with complete data, these findings should be interpreted with caution and considered preliminary. While the results highlight important aspects of community health, further studies with larger sample sizes, more complete datasets, and longitudinal designs are needed to confirm these findings and support broader public health implications.

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Authors' contributions

All authors contributed substantially to the conception and design of the study. Data collection and curation were performed by the research team during the community-based health screening activity. Data analysis and interpretation were conducted collaboratively. The manuscript was drafted, reviewed, and approved by all authors. All authors agree to be accountable for all aspects of the work and ensure the integrity and accuracy of the reported findings.

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Conflict of interest

The authors declare that there are no conflicts of interest related to this work.

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