

## **Textbook Ownership and Knowledge Among Final-Year Nursing Students in Gorontalo**

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Submitted: January 1, 2026

Reviewed: March 9, 2026

Accepted: March 18, 2026

### **ABSTRACT**

Understanding biostatistics is one of the essential foundations in nursing science. This is because it is closely related to the development of evidence-based nursing. This study aimed to assess nursing students' knowledge of biostatistics. This descriptive analytic study was conducted among final-semester nursing students in November 2025. The sample size in this study was 64 participants, calculated using the Slovin formula with a 10% margin of error. Samples were selected using a consecutive sampling technique to examine students' knowledge based on age, gender, semester, university admissions, personal biostatistics reference, and seminar/workshop experience. Descriptive and correlational data analyses were performed using SPSS version 22 software. The results of this study indicate that most students have good knowledge of biostatistics, and there is a significant correlation between ownership of personal biostatistics textbooks and students' knowledge ( $p= 0.040$ ). The findings of this study provide information for both students and institutions regarding the benefits of owning personal biostatistics references on knowledge and understanding. This may serve as a consideration when recommending personal ownership of references, given greater access to knowledge.

**Keywords:** Nursing students; Biostatistic; Personal textbook; Data analysis; Evidence-based nursing

### **INTRODUCTION**

Biostatistics competence is an essential foundation in modern nursing education, which is transforming evidence-based practice (EBP). Significant limitations in statistical knowledge and application have been documented in nursing education, research, and practice for several decades, while the increasing complexity of medical and public health data demands more advanced quantitative literacy (1). Nursing students face significant difficulties in understanding statistical analysis, research terminology, and accessing research findings, which become major barriers to the implementation of EBP (2). In addition, recent research conducted in Surakarta reported that only 4.4% of nursing students truly understand research in nursing science (3). This indicates that many nursing students still have a limited understanding, thus necessitating fundamental research.

The impact of limited biostatistics knowledge among nursing students is multidimensional and has long-term implications for the quality of the nursing profession. Difficulties in understanding statistical analysis, limited access to research findings, insufficient relevant evidence, and unfamiliarity with research terminology pose challenges to EBP competence among undergraduate nursing students (4). Although statistical knowledge

and skills are essential for promoting evidence-based practice, health science students often express anxiety about statistics courses, which may hinder their learning of statistical concepts (5). At the academic level, deficiencies in biostatistical knowledge result in delays in thesis completion, suboptimal research methodology, and limited ability to critically appraise the scientific literature. Furthermore, most residents in related studies demonstrate insufficient biostatistical knowledge to interpret many findings in published clinical research (6), indicating that this issue extends beyond undergraduate students and into professional practice.

Final-year nursing students represent a critical phase in undergraduate nursing education, as they transition from theoretical learning to independent research application through the completion of a thesis. At this stage, students are required to master essential biostatistics competencies, including: (1) understanding various research designs and the ability to select appropriate designs based on research questions; (2) fundamental concepts of data; (3) sampling principles and techniques, as well as adequate sample size calculation; (4) selection of appropriate statistical tests; and (5) the ability to interpret statistical analysis results (6). Limitations in mastering these components lead to difficulties in developing rigorous research proposals, which ultimately contribute to delays in thesis completion and the potential decline in the quality of scientific work produced (7,8).

Knowledge of biostatistics is an integral competency with broad implications for professional development and nursing practice throughout a career, rather than merely an academic requirement for graduation. Barriers to comprehensively understanding statistical reports in research articles have been identified as significant obstacles to the utilization of research findings in nursing practice (8). Biostatistical competence empowers nurses to accurately interpret and analyze data, enhancing their ability to understand patient outcomes, identify epidemiological trends, and make evidence-based clinical decisions regarding care strategies. Statistical literacy enables nurses to derive meaningful insights from clinical and research data, contributing to more optimal patient care pathways and improved patient safety (9).

This study is necessary due to the persistent gap between the reported limitations in biostatistics knowledge among nursing students and the absence of objective quantitative baseline data, particularly in Gorontalo. Without such data, educational institutions in this region lack clear evidence to identify specific deficiencies and to design targeted, evidence-based learning interventions. This gap is further compounded by the limited availability of standardized guidelines for biostatistics competencies and instructional content, which may hinder students' readiness to conduct high-quality research, complete their thesis promptly, and implement evidence-based practice. Addressing this gap is essential to support improvements in the quality of nursing education and its downstream impact on patient outcomes. Therefore, this study aims to describe nursing students' level of knowledge regarding biostatistics.

## **METHODS**

This study employed a descriptive design to examine the level of knowledge of final-semester nursing students regarding biostatistics. The study was conducted at the Department of Nursing, Universitas Negeri Gorontalo, in November 2025. The minimum sample size was calculated using the Slovin formula with 10% margin of error, resulting in a minimum of 58 participants. An additional 10% was added to account for potential dropouts, yielding a total

sample of 64 participants. The sampling technique used was consecutive sampling, with inclusion criteria consisting of final-semester nursing students willing to participate and complete the study by signing informed consent. The exclusion criteria included students who had exceeded the normal duration of the undergraduate program. The instrument used in this study was developed by the research team and categorized knowledge levels as good, moderate, or poor. The instrument underwent validity testing using Pearson's product-moment correlation, with results ranging from 0.501 to 0.835, and reliability testing using Cronbach's alpha, yielding a value of 0.757. Data analysis in this study included descriptive and correlational analyses using SPSS version 22 software.

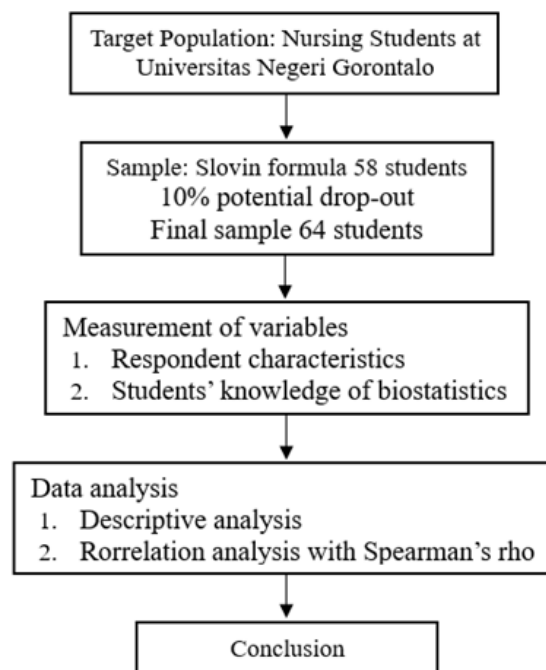


Figure 1. Research Stages Flowchart

## RESULTS

The results of this study showed that the majority of students were female (84%), and most were 21 years old (63%). Based on the university admissions process for state universities, most students were selected through independent selection (44%), while the fewest were through the computer-based test (CBT) examination (22%). Most students did not have personal biostatistics textbook references (77%), and only a small proportion had attended seminars or workshops on research methods or biostatistics (28%). All students (100%) in this study were in their final semester.

**Table 1. Respondent Characteristics**

Variabel	n	%	Mean ± SD	Minimum	Maximum
Age			20.91 ± 0.684	20	23
20 years old	16	25			
21 years old	40	63			
22 years old	6	9			
23 years old	2	3			
Gender					
Men	10	16			
Women	54	84			
Semester					
Final semester	64	100			
University admissions					
Achievement-based	22	34			
CBT examination	14	22			
Independent selection	28	44			
Personal biostatistics reference					
Have	15	23			
Do not have	49	77			
Seminar/workshop experience					
Yes	18	28			
No	46	72			

The results of the Spearman rank test showed a significant correlation between personal ownership of biostatistics textbook references and student knowledge of biostatistics ( $p = 0.040$ ,  $p < 0.05$ ). Meanwhile, age, gender, semester, PTN entrance selection, and experience attending seminars or workshops were not significantly correlated ( $p > 0.05$ ).

**Table 2. Students' Knowledge Overview**

Variabel		Students' Knowledge			p-value
		Good n (%)	Moderate n (%)	Low n (%)	
Age	20 years old	8 (50)	4 (25)	4 (25)	0,375
	21 years old	19 (47)	10 (26)	11 (27)	
	22 years old	6 (100)	0 (0)	0 (0)	
	23 years old	0 (0)	2 (100)	0 (0)	
Gender	Men	6 (60)	0 (0)	4 (40)	0,920
	Women	27 (50)	16 (30)	11 (20)	
Semester	Final semester	33 (52)	16 (25)	15 (23)	0,999
University admissions	Achievement-based	10 (46)	6 (27)	6 (27)	0,227
	CBT examination	5 (36)	6 (43)	3 (21)	
	Independent selection	18 (64)	4 (14)	6 (22)	
Personal biostatistics reference	Have	11 (74)	2 (13)	2 (13)	0,040*
	Do not have	29 (59)	12 (25)	8 (16)	
Seminar/workshop experience	Yes	8 (45)	6 (33)	4 (22)	0,651
	No	25 (54)	10 (22)	11 (24)	

Spearman's rho test; \* $p < 0.05$

## **DISCUSSION**

This study found a significant correlation between personal ownership of biostatistics references and nursing students' knowledge of biostatistics ( $p = 0.040$ ). Students with personal textbooks demonstrated significantly better knowledge (78%). This finding aligns with a 2024 quasi-experimental study in Pakistan that demonstrated a significant increase in post-course biostatistics knowledge through self-paced access to materials (7). Having personal references allows students to learn flexibly, repeatedly, and in depth without time or place constraints, thereby enhancing their understanding of biostatistics concepts. References such as textbooks provide structured explanations, examples, and exercises, enabling students to systematically grasp concepts and their applications. Research on the statistical education needs of health science students in 2024 confirmed that access to personal resources bridges the gap between theory and practice, resulting in a positive correlation with competency. Mechanism makes personal reference ownership, such as textbooks, a stronger predictor of participation than episodic workshops (10). A study on the effect of open textbook adoption on learning outcomes confirmed that free access to textbooks can significantly improve learning outcomes compared to collective reliance (11–13).

Age and gender were not significantly correlated with biostatistics knowledge ( $p > 0.05$ ), as illustrated in Table 2. This finding is consistent with a multi-institutional study in Saudi Arabia in 2025, which identified English proficiency as the sole demographic factor influencing nursing research competency, rather than age or gender. Knowledge distribution was even across age and gender groups, indicating that academic maturity alone is insufficient without specific learning resources (14). University admissions also showed no significant correlation. Aligns with previous studies that found no relationship between university entrance selection systems and graduate students' Grade Point Average (GPAs) (15). Khosrozadh et al., reported that learning strategies and outcomes were significantly correlated with motivation and self-efficacy. Therefore, each individual's learning outcomes are closely related to motivation and self-efficacy, not to their university entrance pathways (16).

Furthermore, experience attending seminars or workshops did not correlate with knowledge of biostatistics. Aligns with previous research conducted in Indonesia in 2025 on the experiences of nursing educators, which highlighted that active, student-centered methods were more effective than sporadic workshops for developing understanding (17–21). Contrasts with a study by Arif et al., that found that webinars and workshops, as teaching strategies using the Kirkpatrick model, yielded positive results for teamwork, communication skills, and self-confidence among nursing students. However, results on knowledge or understanding were not reported (22).

## **CONCLUSION**

Based on the findings, most students demonstrated a good level of knowledge in biostatistics, and ownership of personal biostatistics textbooks was significantly correlated with students' knowledge, indicating that access to learning resources alone is insufficient without effective utilization and strong self-directed learning skills. However, this study is limited by its descriptive-analytic design, relatively small sample size, and data collection from a single institution, which may reduce generalizability, and by the exclusion of other potential variables influencing knowledge levels. Therefore, future research is recommended to employ more robust designs, include larger and more diverse samples across multiple institutions, and examine additional contributing factors. In practice, it is recommended that

educational institutions encourage not only access to but also the active use of biostatistics learning resources, while fostering students' independent learning skills to enhance their understanding and application of biostatistics.

## ACKNOWLEDGMENTS

We would like to thank all respondents who participated in this research. We used artificial intelligence (AI) to improve the readability and clarity of the language without altering the original meaning of the manuscript.

## REFERENCES

1. Craig S, McConnell H, Stark P, Devlin N, McKeaveney C, Mitchell G. A Convergent Mixed-Methods Evaluation of a Co-Designed Evidence-Based Practice Module Underpinned by Universal Design for Learning Pedagogy. *Nurs Rep.* 2025;15(7). DOI: 10.3390/nursrep15070236
2. Worcester State University. [Internet]. 2024 Jan 18. What Do Nurses Need to Know About Biostatistics? [cited 2025 Dec 2]. Available from: <https://online.worcester.edu/programs/nursing/msn-educator/everything-about-biostatistics/>
3. Rosyida RW, Sari FS, Flores MJ. Factors Associated with Knowledge, Attitudes, and Practices of Evidence-Based Practice (EBP) Among Undergraduate Nursing Students. *2022*;65–72. DOI: 10.24990/inject.v20i1.759
4. Purabdollah M, Zamanzadeh V, Ghahramanian A, Valizadeh L, Mousavi S, Ghasempour M. Competencies expected of undergraduate nursing students: A scoping review. *Nurs Open. United States*; 2023;10(12):7487–508. DOI: 10.1002/nop2.2020
5. Chicas RC, Reese C, Abiri A, Bhat S, Chance-Revels R, Hamilton J, et al. Assessing social determinants of health competencies among nurses. *Nurs Outlook.* 2025;73(2):102380. DOI: <https://doi.org/10.1016/j.outlook.2025.102380>
6. Amit-Aharon A, Melnikov S, Warshawski S. The effect of evidence-based practice perception, information literacy self-efficacy, and academic motivation on nursing students' future implementation of evidence-based practice. *Journal of Professional Nursing.* 2020;36(6):497–502. DOI: <https://doi.org/10.1016/j.profnurs.2020.04.001>
7. Salam M us, Khatoon R, Parveen R, Raza S, Rahimon M, Maria B. The Effect of Biostatistics Course among Undergraduate Nursing Students. *Medical Journal of South Punjab.* 2024;5(1):130–5. DOI: 10.61581/mjosp.vol05/01/21
8. Tomak L, Civanbay H. Evaluation of biostatistics knowledge and skills of medical faculty students. *Journal of Experimental and Clinical Medicine (Turkey).* 2022;39(3):620–7. DOI: 10.52142/omujecm.39.3.5
9. Kiekkas P, Panagiotarou A, Malja A, Tahirai D, Zykai R, Bakalis N, et al. Nursing students' attitudes toward statistics: Effect of a biostatistics course and association with examination performance. *Nurse Educ Today.* 2015;35(12):1283–8. DOI: <https://doi.org/10.1016/j.nedt.2015.07.005>
10. Nowacki AS, Brearley AM, Oster RA, Slade E, Devick KL, Hayat MJ, et al. Diagnosing Statistical Education Needs of Health Science Learners. *Journal of Statistics and Data Science Education. Taylor & Francis;* 2025;33(2):199–209. DOI: 10.1080/26939169.2024.2333731

11. Fischer L, Hilton J 3rd, Robinson TJ, Wiley DA. A multi-institutional study of the impact of open textbook adoption on the learning outcomes of post-secondary students. *J Comput High Educ. United States*; 2015;27(3):159–72. DOI: 10.1007/s12528-015-9101-x
12. Clinton Virginia, Khan Shafiq. Efficacy of Open Textbook Adoption on Learning Performance and Course Withdrawal Rates: A Meta-Analysis. *AERA Open. SAGE Publications Inc*; 2019;5(3):2332858419872212. DOI: 10.1177/2332858419872212
13. Beile PM, deNoyelles A, Raible J. Analysis of an Open Textbook Adoption in an American History Course: Impact on Student Academic Outcomes and Behaviors. *Coll Res Libr [Internet]*. 2020; 81:721. Available from: <https://api.semanticscholar.org/CorpusID:218624030>
14. Seblova D, Berggren R, Lövdén M. Education and age-related decline in cognitive performance: Systematic review and meta-analysis of longitudinal cohort studies. *Ageing Res Rev*. 2020; 58:101005. DOI: <https://doi.org/10.1016/j.arr.2019.101005>
15. Almarwani AM. Factors influencing undergraduate and newly graduated nursing students' competence and attitudes toward nursing research: a structural equation modeling analysis. *BMC Nurs. England*; 2025;24(1):585. DOI: 10.1186/s12912-025-03198-3
16. Khosrozadh M, Kordestani Moghadam P, Shahidi Delshad E, Mohammadi R, Mohammadi S, Yarahmadi S. Motivational Strategies for Learning Among Undergraduate Nursing Students: A Descriptive and Analytical Study. *Journal of Archives in Military Medicine*. 2025;13(3). DOI: 10.5812/jamm-164463
17. Grøndahl VA, Andersen KL, Helgesen AK, Asniar A, Martinsen R, Septiani R, et al. Indonesian Nursing Educators' Experiences with Developing Student-Centered Learning Methods. *Nursing reports (Pavia, Italy). Switzerland*; 2025;15(3). DOI: 10.3390/nursrep15030081
18. Bhardwaj V, Zhang S, Tan YQ, Pandey V. Redefining learning: student-centered strategies for academic and personal growth. *Front Educ (Lausanne) [Internet]*. 2025; Volume 10. Available from: <https://www.frontiersin.org/journals/education/articles/10.3389/educ.2025.1518602>
19. Yao Q, Zhu P, Yu X, Cheng Y, Cui W, Liu Q. The Effectiveness of the Student-Centered Flipped Classroom Approach in Medical Anatomy Teaching: A Quasi-Experimental Study. *Clin Anat. United States*; 2025;38(4):496–504. DOI: 10.1002/ca.24267
20. Kerimbayev N, Umirzakova Z, Shadiev R, Jotsov V. A student-centered approach using modern technologies in distance learning: a systematic review of the literature. *Smart Learning Environments*. 2023;10(1):61. DOI: 10.1186/s40561-023-00280-8
21. Martin-Alguacil N, Avedillo L, Mota-Blanco R, Gallego-Agundez M. Student-Centered Learning: Some Issues and Recommendations for Its Implementation in a Traditional Curriculum Setting in Health Sciences. Vol. 14, *Education Sciences* 2024. p. 1179.
22. Arif S, Ashiq Ali A, Chandani S, Shafi Z. Exploring the Effectiveness of Student-Led Webinars and Workshops as Teaching Strategies Using Kirkpatrick Model Among MSN Students. *Journal of Asian Development Studies*. 2025;14(1):399–405. DOI: 10.62345/jads.2025.14.1.30