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Enrollment, Graduation, and Dropout Trends in Nepalese Higher Education: A Mathematical and Statistical Analysis

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Abstract

Enrollment expansion in Nepalese higher education has coincided with fluctuating graduation output, highlighting concerns about student persistence and timely completion. This study examines enrollment and graduation trends alongside evidence on student attrition using secondary administrative data from the University Grants Commission's Education Management Information System series for 2016/17–2023/24, with comparable observations available for 2016/17–2021/22 and 2023/24. Mathematical and statistical indicators assessed enrollment, female participation, graduate output, staffing, campus provision, student–teacher ratios, and graduation-to-enrollment ratios. Total enrollment increased from 371,184 to 633,053, corresponding to an approximate compound annual growth rate of 7.9% over seven years. Female enrollment rose from 195,133 to 358,140, increasing women's share from approximately 52.6% to 56.6%. Graduate numbers declined from 90,922 in 2016/17 to 79,541 in 2019/20, fell sharply to 37,619 in 2020/21, and recovered to 97,564 in 2023/24. This pandemic-era decline is interpreted as a disruption in the academic pipeline rather than a direct indicator of changing student demand. A central methodological finding is that the UGC trend tables do not provide a consistent national cohort-based dropout rate; consequently, differences between enrollment and graduate numbers were not classified as dropout rates. Instead, cautious non-completion proxies were triangulated with campus-level attrition studies and evidence concerning migration, financial pressure, academic

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difficulty, limited student support, and prolonged degree completion. The study concludes that enrollment growth alone is insufficient to assess higher education performance and should be examined alongside graduation output, persistence, and labor-market relevance. Its contribution lies in clarifying the limits of aggregate indicators and identifying the need for a national student-level longitudinal data system linking admission, registration, examination attempts, progression, graduation, withdrawal, migration, and re-entry to enable survival analysis and cohort-specific dropout estimation. Policy priorities include stronger advising and early-warning systems, curriculum modernization, reduced administrative delays, improved financial support, and responses to migration-related opportunity costs.

Keywords: Higher Education; Enrollment Trends; Graduation; Student Attrition; Nepal

INTRODUCTION

Higher education is one of the main institutional mechanisms through which a country converts demographic potential into productive human capital. For Nepal, the issue is especially important because the country is experiencing simultaneous expansion of tertiary education, rapid internal and international mobility of young people, changing labor-market expectations, and persistent institutional differences across universities and provinces. A system can enroll more students while still losing a substantial share before degree completion. Therefore, enrollment alone is an incomplete measure of educational progress.

The University Grants Commission's EMIS reports provide the most comprehensive national administrative picture of Nepalese higher education. The 2023/24 report records 633,053 students in higher education, 358,140 of them female, 97,564 graduates, 12,082 teachers, and 1,432 campuses. The same report provides a longer trend series beginning in 2016/17. These data make it possible to examine the relationship between access, system capacity, and output over time.

The topic of dropout requires particular care. A student who disappears from one campus record may transfer to another institution, pause study, migrate abroad, repeat a year, or return later. Conversely, a graduate in a given year may have entered the system several years earlier. Thus, subtracting graduates from enrollment is not a valid cohort dropout calculation. This paper treats dropout as an attrition phenomenon and uses national trend indicators plus campus-level empirical studies to interpret it.

Research Problem

The central research problem is the apparent mismatch between the growth of higher education participation and the capacity of the system to convert enrollment into timely completion. The problem has three dimensions. First, access has expanded, but participation remains below the level of many comparable countries. Second, the production of graduates fluctuates strongly and was particularly disrupted around the COVID-19 period. Third, campus-level studies report substantial dropout associated with financial constraints, academic difficulty, family responsibilities, foreign migration, weak institutional support, and perceived mismatch between education and employment.

Research Questions

- How has higher education enrollment in Nepal changed from 2016/17 to 2023/24?
- How has female participation changed relative to total enrollment?
- What trend is visible in graduate production, and what does the graduate-to-enrollment ratio tell us?
- What can be inferred about dropout/attrition from national statistics and campus-level evidence without overstating the data?
- Which mathematical and statistical indicators can support a stronger national monitoring framework?

Background and Nepalese Higher Education Context

Nepal's higher education system includes universities, medical academies and their constituent, community and private campuses. Over time, the number of providers and campuses has expanded, while Tribhuvan University (TU) has remained structurally dominant. UGC data show that total campuses increased from 1,408 in 2016/17 to 1,455 in 2021/22, before the reported count fell to 1,432 in 2023/24. This small numerical contraction alongside continued enrollment growth suggests that the number of institutions alone is not a sufficient indicator of system capacity.

The World Bank's recent Nepal Human Capital Review emphasizes that tertiary enrollment remains relatively low compared with lower-middle-income peers and that migration and weak domestic labor-market absorption influence how young people invest in education. The report also stresses the broader human-capital problem: educational

attainment must be translated into productive employment, and this requires both quality and relevance.

Access Has Expanded, but Expansion Is Uneven

The national enrollment trend is positive over the long run, but the series is not monotonic. Enrollment increased every year from 2016/17 through 2019/20, fell slightly in 2020/21, then rose sharply in 2021/22 and reached a new high in 2023/24. The 2020/21 decline coincided with COVID-19 disruption, while the later rebound indicates delayed or recovered participation. Importantly, the UGC series does not report 2022/23 in the same trend table, so this paper does not interpolate or invent a value for that year.

The Gender Pattern

Female participation has become a major strength of the system. In 2016/17, women represented approximately 52.6% of the students in the UGC trend series; by 2023/24 the share was approximately 56.6%. This does not mean that gender inequality has disappeared. Female participation can coexist with inequalities by geography, income, field of study, level of education, labor-force participation and transition into employment. Nevertheless, the direction of the national enrollment data indicates that women are an increasingly important component of Nepal's higher education population.

Why Graduation Matters

Graduation is the output side of the higher education pipeline. UGC's 2024–2029 Strategic Plan identifies low graduation and graduate employability as major concerns. The plan reports an average graduation rate around 30% in its broader system diagnosis, while also noting insufficient skills and high graduate unemployment. This reinforces the argument that the policy goal should be framed as 'enrollment plus completion plus relevance' rather than enrollment alone.

Review of Literature

The literature on Nepalese higher education can be grouped into four connected strands: system expansion, institutional concentration, student dropout, and international mobility. The first strand documents expansion in enrollment and the gradual diversification of universities. Trital, Kharel and Acharya's analysis of tertiary enrollment identifies a broad upward trend and continued dominance of TU. Recent UGC EMIS reports similarly show national enrollment growth.

The second strand concerns system concentration. TU continues to carry a very large share of national students and graduates. Concentration can generate economies of scale and nationwide access, but it can also produce congestion, administrative pressure, uneven student services, and dependence on one institution. The appropriate statistical response is not simply to criticize concentration but to measure it and compare it with institutional capacity and output.

The third strand is dropout and retention. Campus-level studies in Nepal report substantial attrition and identify foreign migration, financial pressure, academic difficulties, family responsibilities, heavy workloads, weak student support, and perceived lack of labor-market relevance as recurring factors. These studies are valuable because they observe actual student trajectories, but they are usually single-campus or single-program studies and therefore cannot automatically be generalized to the national population.

The fourth strand is international student mobility. Nepal has experienced a large increase in students seeking education abroad. NOC issuance is not identical to actual enrollment abroad, and it should not be treated as a direct measure of domestic dropout. Nevertheless, study-abroad decisions create an opportunity-cost channel: students who leave after beginning a domestic program may become institutional attrition, while students who leave before enrollment are primarily a demand and mobility phenomenon.

Recent scholarship by Sahani and collaborators (2023–2026) demonstrates a progressive integration of numerical methods, differential equations, and machine learning to solve complex socio-cultural and operational challenges. The provided literature broadly synthesizes into three distinct phases of research, transitioning from socio-cultural modeling to advanced hybrid architectures for systemic risk management.

Socio-Cultural Modeling and Educational Optimization

Initial research heavily focuses on applying quantitative mathematical methods to cultural and educational dynamics. Sahani and colleagues utilize numerical differential equations to model the impact of cultural education policies on literacy rates and simulate value conflicts within heterogeneous, multicultural societies (Sahani & Prasad, 2023; Sahani & Karna, 2024; Sahani et al., 2025). This foundational work extends into practical programmatic optimization, offering mathematically driven solutions to systemic educational challenges specifically within Nepal (Sah et al., 2024; Sahani & Sah, 2025; Sahani & Karna, 2025).

Advanced Mathematical Frameworks in Engineering

Parallel to their socio-cultural work, the authors established robust analytical frameworks using differential equations for specialized technical domains, such as aerospace engineering (Sahani, Sah, et al., 2024). This mathematical rigor laid the groundwork for solving complex deterministic and stochastic differential equations, focusing heavily on operational stability, convergence, and the quantification of deep uncertainty (Sahani, Lee, et al., 2026).

Hybrid Machine Learning Architectures in Nepalese Management

The most recent 2026 publications mark a significant shift toward deploying hybrid analytical-numerical-machine learning frameworks across institutional management systems. These highly adaptable architectures are utilized to drive decision-making, optimize resource allocation, and manage risk in multifaceted environments. Key applications include: Financial Systems: Deploying explainable machine learning for intelligent lending decisions and credit risk management in Nepalese cooperative banks. Healthcare and Clinical Practice: Utilizing hybrid frameworks and biotechnological catalysts to optimize operational efficiency, risk forecasting, and decision-making in Nepalese health management and specialized dental practice systems. Broad Systemic Management: Integrating deep uncertainty quantification to stabilize deterministic and stochastic risk management across various Nepalese institutional frameworks. Collectively, this body of work illustrates a unique trajectory of using classical mathematical modeling (differential equations) as a bridge to modern, machine-learning-augmented systems that address distinct localized challenges in Nepal's education, finance, and healthcare sectors.

Theoretical Perspective

The analysis is informed by human-capital theory, student integration/retention perspectives, and a simple educational production-function view. Human-capital theory predicts that individuals compare expected returns from education with costs and alternatives. Retention perspectives emphasize academic integration, social connection, institutional support and financial conditions. The production-function view treats enrollment as an input and graduates, skills and employment as outputs, while recognizing that the conversion process is affected by resources, governance, curriculum and time.

Research Gap

A notable gap is the absence of a national longitudinal dropout series that can be directly compared with enrollment and graduation. National reports contain rich administrative statistics, while many dropout studies provide detailed local evidence. A stronger research design would connect these two levels by following student cohorts across institutions and years. This paper therefore contributes a statistical framework and a cautious interpretation rather than claiming a precise national dropout rate that the available data cannot support.

Conceptual Framework

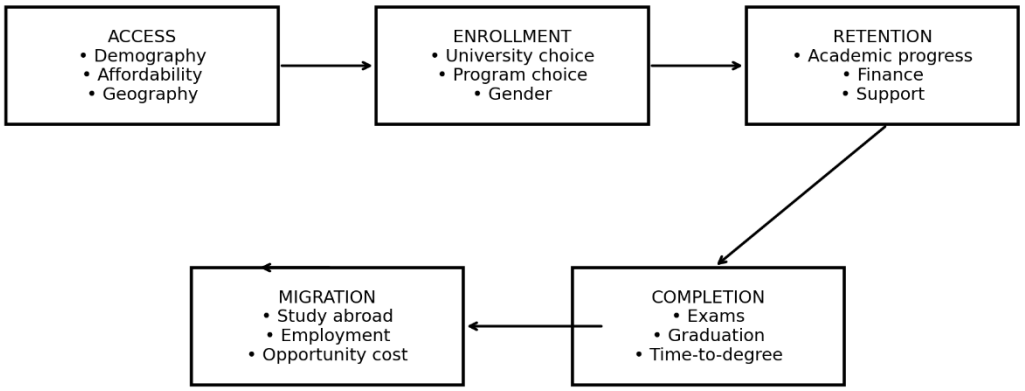


Figure 1. Conceptual framework linking access, enrollment, retention, migration and completion.

The framework treats higher education as a pipeline rather than a single count. Access conditions determine who can enter. Enrollment records the stock of students registered at a point in time. Retention describes whether students remain active and progress through academic requirements. Migration and other opportunity costs can alter the probability of continuation. Completion is reflected in examination success, graduation and timely degree attainment.

This framework has a direct statistical implication: the ideal national unit of analysis is the individual student cohort, not the annual aggregate. If each student has an anonymized longitudinal identifier, the system can estimate the probability of remaining enrolled at each semester, the hazard of dropout, the probability of graduation, and the expected time to completion. Aggregate annual data can then be used for validation and system-level monitoring.

Key Variables

Enrollment (E_t): number of students enrolled in year t.

Female enrollment (F_t): number of female students enrolled in year t.

Graduates (G_t): number of graduates recorded in year t.

Teachers (T_t): number of teachers in year t.

Campuses (C_t): number of campuses in year t.

Female share: F_t / E_t × 100.

Student–teacher ratio: E_t / T_t.

Graduate-to-enrollment ratio: G_t / E_t × 100, used only as a descriptive stock-flow indicator.

True cohort graduation rate: graduates from a defined entry cohort / entrants in that cohort × 100, which requires longitudinal data.

A National Retention Equation

Let S_t be the number of active students at time t. A simplified balance equation is S_{t+1} = S_t + A_t − G_t − D_t − W_t + R_t, where A_t is new admission, G_t is graduation, D_t is dropout/withdrawal, and R_t is re-entry or returning students. The key unknown for national dropout monitoring is D_t. Annual enrollment and graduation totals alone do not identify D_t because admissions, transfers, repeaters and returning students are not fully separated in the aggregate series.

METHODOLOGY

This study uses a secondary-data research design. The principal source is the University Grants Commission of Nepal's Education Management Information System (EMIS), especially the Report on Higher Education 2023/024 A.D. (2080/081 B.S.) and the preceding 2021/22 report. The dataset contains year-wise counts of students, female students, graduates, teachers and campuses. International and comparative context is drawn from UNESCO Institute for Statistics and the World Bank. Interpretive evidence on dropout is drawn from recent peer-reviewed Nepalese studies.

Study Period and Data Harmonization

The main comparable national trend covers 2016/17–2021/22 and 2023/24. The UGC 2023/24 trend table does not list 2022/23, so the missing year is retained as missing.

No interpolation is used. This is important because an artificial value could change growth rates and distort conclusions.

Mathematical and Statistical Tools

Absolute change: $\Delta X = X_t - X_0$.

Percentage change: $\%\Delta X = (X_t - X_0) / X_0 \times 100$.

Compound annual growth rate: $CAGR = (X_t / X_0)^{(1/n)} - 1$.

Female participation share: $F_t/E_t \times 100$.

Student–teacher ratio: E_t/T_t.

Students per campus: E_t/C_t.

Graduate-to-enrollment ratio: $G_t/E_t \times 100$, explicitly not interpreted as a cohort graduation rate.

Growth instability: year-to-year percentage changes are inspected to identify shocks and rebounds.

Concentration analysis: institutional shares are used to examine the structural weight of large universities.

Validity and Limitations

The national dataset is appropriate for descriptive system analysis but has limitations for causal inference. It is not a student-level panel. The timing of graduation differs from the timing of admission, and students can repeat, transfer, pause, or re-enter. The data also show a missing year in the trend table. Therefore, the paper distinguishes carefully between observed national trends and inferred mechanisms. Campus-level dropout findings are treated as contextual evidence, not as national estimates.

Reproducibility

All calculations in this paper can be reproduced from the numerical series presented in Table 1. The derived indicators are deterministic transformations of UGC-reported counts. Graphs are generated from the same data, and rounding is limited to one decimal place where appropriate.

RESULTS

National Enrollment Trend

Table 1. National higher education indicators used in the analysis. Source: UGC EMIS trend data

Year	Enrollment	Female	Graduates	Teachers	Campuses
2016/17	371,184	195,133	90,922	9,299	1,408
2017/18	423,996	222,981	88,115	9,269	1,425
2018/19	441,819	229,961	84,510	9,269	1,432
2019/20	466,828	247,370	79,541	11,748	1,437
2020/21	460,826	242,103	37,619	11,031	1,440
2021/22	579,448	319,337	88,902	10,916	1,455
2023/24	633,053	358,140	97,564	12,082	1,432

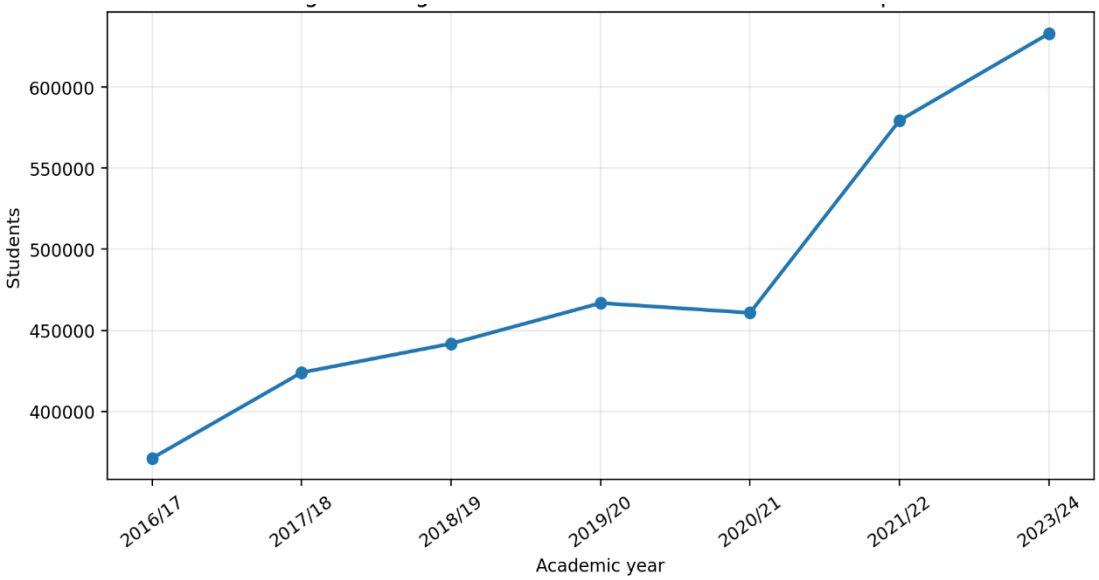


Figure 2. Higher education student enrollment in Nepal, 2016/17–2023/24.

Enrollment increased by 261,869 students, equivalent to 70.5% growth across the seven-year interval. The CAGR is 7.9%. The trend is therefore strongly upward over the full period even though the annual path is uneven.

The 2020/21 fall is small in percentage terms relative to the subsequent rebound, but it is analytically important because it interrupts an otherwise rising sequence. The subsequent increase from 460,826 in 2020/21 to 579,448 in 2021/22 is approximately 25.8%, followed by a further increase to 633,053 in 2023/24. This pattern is consistent with a recovery and expansion process, although the national data alone cannot identify the relative contribution of delayed admissions, re-registration, demographic change, or migration-related behavior.

Female Enrollment and Gender Dynamics

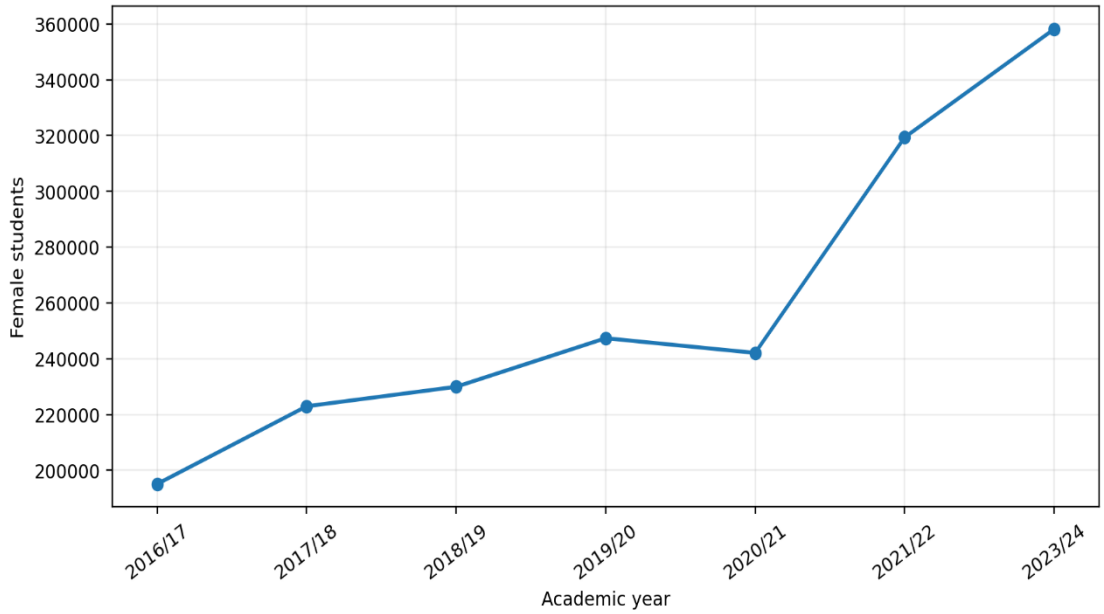


Figure 3. Female student enrollment in Nepal

Table 2. Female enrollment and share calculated from UGC counts

Year	Female students	Female share	Male/other reported total
2016/17	195,133	52.6%	176,051
2017/18	222,981	52.6%	201,015
2018/19	229,961	52.0%	211,858
2019/20	247,370	53.0%	219,458
2020/21	242,103	52.5%	218,723
2021/22	319,337	55.1%	260,111
2023/24	358,140	56.6%	274,913

Female enrollment increased by 163,007 students, or 83.5%, between 2016/17 and 2023/24. The female share increased by 4.0 percentage points. This is one of the clearest positive structural changes in the dataset.

However, participation should not be equated with equal educational outcomes. Gender parity can differ by field, level, location, income group and transition to employment. In addition, international and labor migration can alter the denominator of young adults available for domestic study. A complete gender analysis would therefore examine female progression from bachelor to master and doctoral study, field-level concentration, completion time, and employment after graduation.

Interpretation

The increase in female enrollment suggests that barriers to entry have declined for many women. It also implies that universities must design student services around a more gender-balanced and increasingly female-majority student population. Flexible scheduling, safe transport and accommodation, mentoring, childcare-sensitive support where relevant, and equitable participation in technical fields can help ensure that higher female enrollment produces durable human-capital gains.

8. Graduation Trend and the Enrollment–Output Relationship

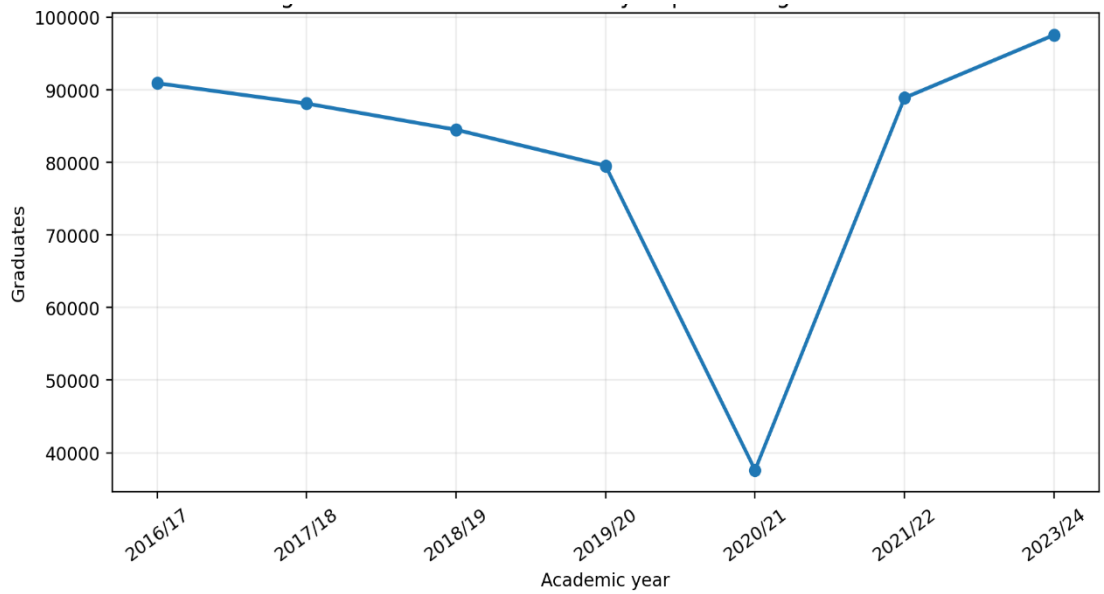


Figure 4. Graduates produced by Nepalese higher education institutions.

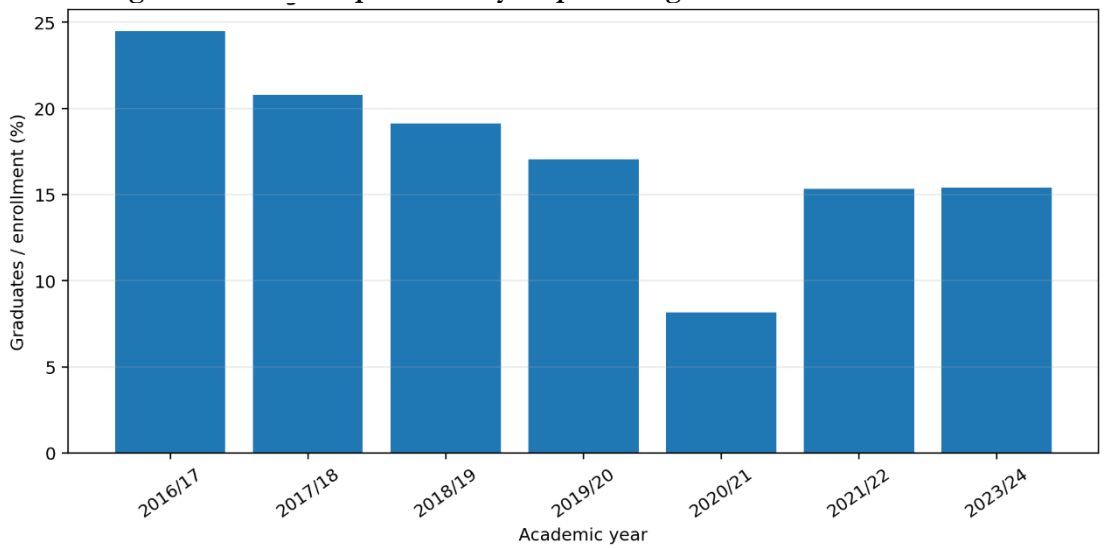


Figure 5. Same-year graduates as a share of enrollment. This is not a cohort graduation rate

Table 3. Graduate output and selected efficiency indicators

Year	Graduates	Graduates/Enrollment	Students per teacher
2016/17	90,922	24.5%	39.9
2017/18	88,115	20.8%	45.7
2018/19	84,510	19.1%	47.7
2019/20	79,541	17.0%	39.7
2020/21	37,619	8.2%	41.8
2021/22	88,902	15.3%	53.1
2023/24	97,564	15.4%	52.4

Graduate output declined from 90,922 in 2016/17 to 79,541 in 2019/20, then dropped sharply to 37,619 in 2020/21. It subsequently recovered to 88,902 in 2021/22 and 97,564 in 2023/24. The 2020/21 observation is therefore a major structural break in the output series.

The full-period CAGR for graduates is approximately 1.0%, but this average conceals a large temporary shock. The most useful interpretation is that the higher education pipeline was disrupted and later recovered. UGC reports have repeatedly noted academic-calendar delays and administrative problems affecting enrollment, examinations and results. These system frictions can shift graduation across years without necessarily representing permanent dropout.

The graduate-to-enrollment ratio ranges from approximately 8.2% in 2020/21 to 24.5% in 2016/17. It should not be called a 'graduation rate' because the numerator and denominator refer to different cohorts. Nevertheless, it is a useful descriptive signal of how many graduates are being produced relative to the size of the enrolled stock.

Dropout, Attrition and Non-Completion

Dropout is the most difficult component of the title to estimate from national aggregate data. A valid dropout rate normally requires a defined cohort and a rule for determining whether a student has left permanently. The UGC national trend table reports total enrollment and total graduates but does not provide a directly comparable national cohort dropout series. Consequently, this paper avoids the common but statistically invalid calculation 1 − graduates/enrollment.

Why Enrollment Minus Graduation Is Not Dropout

Suppose 100,000 students are enrolled in a year and 20,000 graduate. It does not follow that 80,000 dropped out. The 100,000 may include first-year students, continuing

students, repeaters and students who will graduate in later years. The 20,000 graduates may have entered several years earlier. Transfers and re-entry further complicate the relationship. The correct national approach is to follow an entry cohort through successive years.

Evidence from Campus-Level Studies

Recent Nepalese studies provide important local evidence. A Baneshwor Multiple Campus study reports dropout patterns associated particularly with foreign migration and social-economic factors. A Marsyangdi Multiple Campus study reported that 65.47% of sampled B.Ed. students had left before completing the degree. A Kailali Multiple Campus study similarly examines dropout using enrollment and examination records plus student information. A 2026 study from Myanglung Campus identifies student-related, campus-related and family-related factors. These studies point to a multidimensional process rather than a single cause.

Main Mechanisms

Financial pressure: tuition, living costs, transportation and the opportunity cost of not working.

Academic difficulty: repeated failure, heavy course loads and weak preparation.

Institutional delays: prolonged academic calendars, examination delays and slow results.

Weak academic integration: limited advising, mentoring and career guidance.

Migration: students leaving for foreign study or employment after entering a domestic program.

Perceived low returns: doubts about employability and the relevance of curricula.

Family and social responsibilities: work, care obligations and household shocks.

Geographic and institutional inequality: differences in quality, facilities, teachers and access.

These mechanisms interact. For example, a student who experiences academic difficulty may also face financial pressure; a student with weak career prospects may perceive migration as a better investment; and an institutional delay can amplify the opportunity cost of staying.

Migration, Study Abroad and Domestic Attrition

International mobility is a distinctive factor in Nepal's higher education system. Ministry of Education data on No Objection Certificates (NOCs) show a very large increase over the last decade, especially around 2021/22 and 2022/23. An NOC is not equivalent to a dropout from a Nepalese university because many students may leave before entering a

domestic program. However, for students who have already enrolled, migration can become a direct attrition mechanism.

The World Bank's Nepal Human Capital Review links relatively low domestic tertiary enrollment with migration dynamics and emphasizes that many young adults seek opportunities abroad. Recent Nepalese studies also identify foreign migration as a prominent factor in higher-education dropout. This creates a policy paradox: migration can generate household income and foreign-exchange earnings while simultaneously reducing the domestic student pool and potentially weakening the supply of skilled graduates.

A Simple Opportunity-Cost Model

Let V_D be the expected lifetime value of completing a domestic degree, C_D its direct and opportunity costs, V_F the expected value of foreign study or employment, and C_F its costs. A simplified decision rule is: choose domestic study if $V_D - C_D \geq V_F - C_F$. Universities can influence V_D through quality, employability, predictable academic calendars, internships, research opportunities and student support. National migration policy and foreign labor demand influence V_F.

Why Migration Should Not Be Framed Only as Brain Drain

International evidence cautions against treating every outward movement as an automatic loss. Migration can generate remittances, networks, knowledge transfer and incentives to acquire skills. The policy objective should therefore be to create credible domestic opportunities while making student mobility a productive part of national human-capital strategy. The most immediate institutional concern is identifying students who leave after enrollment and distinguishing permanent withdrawal from temporary mobility.

Recommended Data Link

A national student identifier, protected by privacy safeguards, could connect university records with migration-related administrative indicators. The goal would not be surveillance; it would be statistical classification. A student leaving Nepal could be categorized as: (a) completed domestic degree and migrated; (b) left before completion; (c) transferred abroad; (d) temporarily paused; or (e) status unknown. This would transform a vague dropout debate into measurable student pathways.

Mathematical and Statistical Analysis

Basic notation

Let E_t denote total enrollment in academic year t, F_t female enrollment, G_t graduates, T_t teachers, and C_t campuses. All national calculations in this section use the UGC EMIS counts reported in Table 1.

Absolute change

Absolute change measures how many units an indicator gained or lost between two years. Formula: $\Delta X = X_t - X_0$. For enrollment, $\Delta E = 633{,}053 - 371{,}184 = 261{,}869$ students.

Percentage change

Percentage change expresses the absolute change relative to the starting value. Formula: $\%\Delta X = [(X_t - X_0) / X_0] \times 100$. Therefore, enrollment increased by $[(633{,}053 - 371{,}184) / 371{,}184] \times 100 = 70.54\%$.

Compound Annual Growth Rate (CAGR)

CAGR measures the constant annual rate that would produce the observed beginning and ending values. Formula: $CAGR = [(X_t / X_0)^{(1/n)} - 1] \times 100$. For enrollment over seven years: $CAGR = [(633{,}053 / 371{,}184)^{(1/7)} - 1] \times 100 \approx 7.89\%$ per year.

Female enrollment share

Female share measures the proportion of total enrollment represented by female students. Formula: Female Share = $(F_t / E_t) \times 100$. In 2016/17: $(195{,}133 / 371{,}184) \times 100 \approx 52.57\%$. In 2023/24: $(358{,}140 / 633{,}053) \times 100 \approx 56.57\%$. Thus, the female share increased by about 4.00 percentage points.

Student–teacher ratio

The student–teacher ratio indicates the number of enrolled students per reported teacher. Formula: $STR = E_t / T_t$. In 2023/24: $633{,}053 / 12{,}082 \approx 52.40$ students per teacher. This is a capacity indicator, not a direct measure of teaching quality.

Students per campus

Students per campus is calculated as E_t / C_t. In 2023/24: 633,053 / 1,432 ≈ 442.08 students per campus. A rising value can indicate greater utilization of existing campuses, but it may also imply pressure on infrastructure and student services.

Graduate-to-enrollment ratio

The descriptive graduate-to-enrollment ratio is G_t / E_t × 100. For 2023/24: (97,564 / 633,053) × 100 ≈ 15.42%. This must NOT be interpreted as the national graduation rate because graduates and enrolled students are not the same cohort.

Why this is not a dropout rate

A true dropout rate requires a defined entry cohort. If N_c is the number of students entering in cohort c and D_c(k) is the number permanently leaving before the chosen observation point k, then Cohort Dropout Rate = [D_c(k) / N_c] × 100. Annual enrollment and annual graduates cannot identify D_c because enrollment contains new and continuing students while graduates generally entered in earlier years.

Cohort completion rate

For a cohort entering in year c, let G_c(k) be the number of that same cohort graduating within k years. Then Cohort Completion Rate = [G_c(k) / N_c] × 100. This is the appropriate statistic for measuring completion.

Retention rate

If N_0 is the number of entrants and N_t is the number of those same entrants still active after t periods, then Retention Rate_t = (N_t / N_0) × 100. The complement is not automatically dropout unless transfers, re-entry and other exits have been correctly classified.

Survival analysis for future research

For a longitudinal student dataset, the survival function S(t) can estimate the probability that a student remains enrolled beyond time t. A hazard model can then examine how academic performance, financial pressure, institutional support, migration and other variables change the risk of dropout.

Main numerical conclusion

The mathematical evidence shows strong long-run enrollment expansion: 70.54% growth from 2016/17 to 2023/24, equivalent to a 7.89% CAGR. Female enrollment

increased by 83.54%, while the female share rose by about 4 percentage points. Graduate output was volatile, with a major disruption in 2020/21 followed by recovery. These figures justify deeper cohort-level analysis rather than a simplistic national dropout percentage.

Institutional Concentration and System Capacity

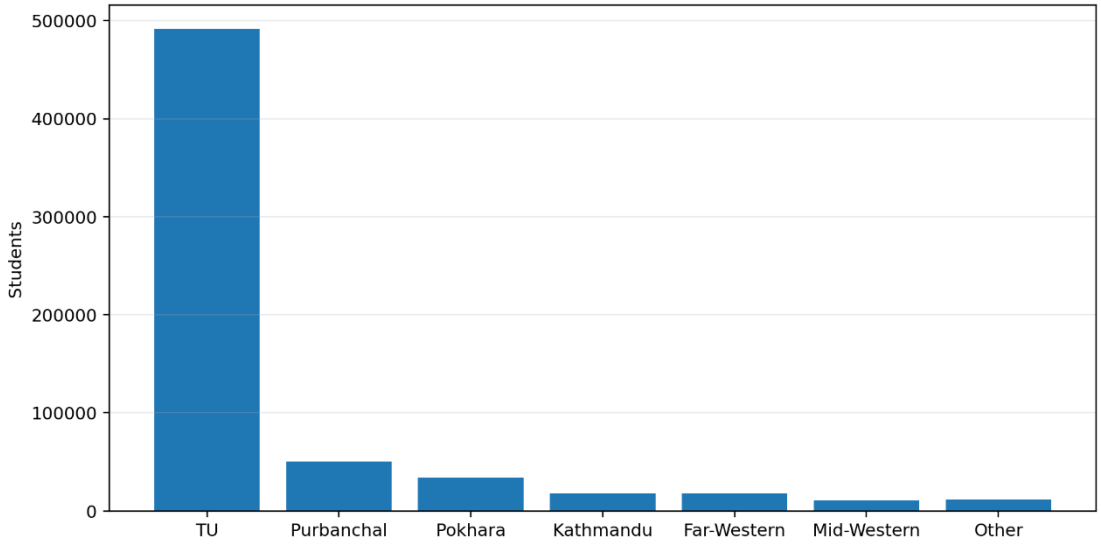


Figure 6. Illustrative concentration of enrollment in selected universities, 2023/24.

The 2023/24 UGC report records 491,299 students in Tribhuvan University, representing roughly three-quarters of the national university enrollment depending on the denominator used. Other universities contribute much smaller shares. This concentration is a structural feature of Nepalese higher education.

Concentration: Benefits and Risks

A large institution can provide broad geographic reach, shared infrastructure, established academic programs and lower average administrative costs. At the same time, extreme concentration can create bottlenecks in examinations, affiliation, results, staffing and student services. It can also make national indicators highly sensitive to the performance of one institution.

Quantifying Concentration

Future national monitoring should calculate the Herfindahl–Hirschman Index (HHI) for enrollment: HHI = Σs_i^2, where s_i is the enrollment share of institution i. A higher HHI indicates greater concentration. A parallel HHI can be calculated for graduates. Comparing enrollment concentration with graduate concentration can reveal whether large institutions

produce graduates in proportion to their enrollment or carry a disproportionate completion burden.

Capacity Expansion vs. Output Expansion

The national data show that enrollment grew by about 70.6% from 2016/17 to 2023/24, while graduates grew by about 7.3% over the same endpoints. This does not mean that only 7.3% of students completed, because the two measures refer to different cohorts. It does mean that the system's student stock has expanded much faster than its annual graduate output. That pattern deserves careful cohort analysis, especially where programs have long completion times.

DISCUSSION

The central finding of this study is that Nepal's higher education system is simultaneously expanding and experiencing conversion challenges. Enrollment growth is substantial, female participation is strong, and graduate output has recovered from the COVID-era disruption. Yet the system's ability to turn enrolled students into timely graduates remains an important policy concern.

The data also show why a single dropout percentage can be misleading. The annual enrollment stock is affected by admissions, repeat enrollment, transfers and re-entry. Graduate output is a lagging flow. A national dropout rate therefore requires a longitudinal cohort structure. Campus-level studies provide evidence that attrition is real and often high, but they vary in program, location and methodology. The strongest conclusion is not that Nepal has one national dropout rate, but that dropout and delayed completion are sufficiently important to justify a national retention system.

The COVID-19 Structural Break

The decline in graduates to 37,619 in 2020/21 is much larger than the enrollment decline in the same year. This suggests that academic disruption affected the output pipeline more strongly than the student stock. Examinations, results, fieldwork, practical sessions and academic calendars were particularly vulnerable to interruption. The rebound in graduate numbers after 2020/21 supports the interpretation of delayed output rather than an equivalent permanent collapse in the student population.

The Female Participation Paradox

Female enrollment is above half of the national total in the UGC series, which is a significant achievement. However, higher education policy should avoid assuming that access equals empowerment. The next analytical step is to examine whether women complete at similar rates, choose similar fields, experience similar delays, and obtain similar labor-market outcomes. A female-majority enrollment system still requires strong attention to equity.

Relevance and Employability

The UGC Strategic Plan identifies graduate employability and university–industry collaboration as key challenges. This is directly related to dropout because perceived low returns from study can lower persistence. Curriculum modernization should therefore be linked to internships, project-based learning, entrepreneurship, digital skills, research experience and transparent labor-market information.

Policy Implications

Move from Enrollment Monitoring to Student-Pathway Monitoring

The national dashboard should report not only how many students are enrolled but also how many enter, progress, repeat, transfer, pause, return, graduate and leave. These indicators should be disaggregated by university, province, level, sex, field and socioeconomic background while protecting personal privacy.

Build an Early-Warning Retention System

Universities can identify risk using attendance, failed examinations, credit accumulation, unpaid fees, repeated semesters and prolonged inactivity. The purpose is not punishment. It is to trigger advising, tutoring, financial assistance, counseling or flexible re-entry before withdrawal becomes permanent.

Reduce Administrative Delays

A predictable academic calendar is itself a retention intervention. When admission, examinations and results are delayed, students face increased opportunity costs and uncertainty. Digital examination management, transparent academic calendars and service-level targets can reduce avoidable attrition.

Strengthen Financial Support

Financial constraints should be treated as a retention variable rather than only an access variable. Scholarships, need-based grants, emergency funds and flexible fee arrangements can prevent students from leaving after investing several years in a degree.

Increase Labor-Market Relevance

Programs should publish learning outcomes, graduate employment indicators, internship opportunities and realistic career pathways. Industry and professional bodies should be involved in curriculum review. The objective is not to make every program narrowly vocational but to demonstrate credible routes from academic learning to productive work.

Develop a National Cohort Study

UGC and universities should select a representative set of cohorts and follow them for at least six years. The resulting longitudinal dataset could estimate true dropout, delayed completion, transfer and re-entry. This would become the statistical backbone for future policy evaluation.

Recommendations

Create a National Higher Education Student ID: Use a privacy-preserving identifier to connect admission, registration, examination, graduation and re-entry records.

Publish Annual Cohort Indicators: Report first-year retention, three-year/ four-year/ five-year completion, dropout, transfer and median time-to-degree by program.

Standardize Dropout Definitions: Distinguish dropout, temporary withdrawal, transfer, migration, academic dismissal and unknown status.

Establish Campus Early-Warning Units: Use simple risk rules and human advising rather than relying on a single predictive score.

Strengthen Academic Advising: Assign students academic mentors and require structured progression reviews.

Reduce Academic-Calendar Delays: Set national service standards for admissions, examinations and publication of results.

Target Financial Retention: Expand need-based scholarships and emergency support for students at high risk of withdrawal.

Improve Program Relevance: Integrate internships, practical projects, digital skills, entrepreneurship and labor-market feedback.

Track Study-Abroad Pathways: Distinguish students who leave before domestic enrollment from those who migrate after enrollment.

Use HHI and Completion Metrics Together: Monitor institutional concentration alongside graduate production and student support capacity.

Disaggregate by Equity Variables: Publish province, sex, disability, socioeconomic and field-level indicators where statistically reliable and privacy-safe.

Conduct Longitudinal Research: Build a national cohort panel to support survival analysis and causal evaluation of retention interventions.

Suggested Statistical Dashboard

Indicator	Definition	Policy use
Entry-to-year-1 retention	Students active after first academic year / entrants	Early attrition
Credit progression rate	Credits earned / credits attempted	Academic difficulty
Time-to-degree	Median years from entry to graduation	Administrative efficiency
Cohort completion	Graduates from cohort / entrants	True graduation
Cohort dropout	Permanent exits / entrants	True attrition
Transfer rate	Transfers / entrants	Mobility
Re-entry rate	Returning students / inactive students	Nonlinear pathways
Female completion gap	Female completion − male completion	Gender equity
HHI enrollment	Σ institution enrollment shares^2	Concentration

CONCLUSION

This paper examined enrollment, graduation and dropout/attrition trends in Nepalese higher education through a mathematical and statistical lens. The national evidence shows a system that has expanded strongly: enrollment increased from 371,184 in 2016/17 to 633,053 in 2023/24, while female participation increased both in absolute numbers and as a share of the total. The number of graduates also recovered strongly after the pandemic-era disruption.

At the same time, the analysis shows why expansion should not be judged by enrollment alone. Graduate output is a lagging flow, and a low graduate-to-enrollment ratio

in a single year cannot be converted into a dropout rate. The appropriate unit for dropout measurement is the student cohort. The current national data architecture is not yet sufficient to estimate a robust cohort-based national dropout rate across all higher education institutions.

Campus-level research nonetheless provides converging evidence that attrition is a serious issue. Financial pressure, academic difficulty, family responsibilities, institutional delays, weak support, perceived low labor-market returns and foreign migration can interact to push students away from completion. These factors suggest that dropout is a process rather than a single event.

The most important statistical recommendation is therefore to establish a national longitudinal student-data system. Once admission, progression, examination, transfer, withdrawal, migration and graduation are linked, Nepal can move from approximate system-level proxies to true cohort measures. Such evidence would allow policymakers to identify where students leave, when they leave, why they leave, and which interventions actually improve completion.

Ultimately, the objective should be a higher education system that expands access without sacrificing persistence, quality or relevance. Nepal has already demonstrated that it can increase participation. The next stage is to ensure that more of those students complete meaningful degrees on time and are able to convert education into productive and socially valuable opportunities.

Final Statistical Interpretation

The evidence supports three broad conclusions: (1) access is expanding; (2) output is recovering but remains volatile; and (3) national dropout cannot yet be measured validly from aggregate enrollment and graduation totals alone. The third conclusion is not a weakness of the research—it is a finding about the country's data system and a direct guide for future statistical reform.

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Appendix A. Reproducible Data and Derived Indicators

The following table provides the full numerical series used to generate the analysis. Values are reported as counts unless otherwise indicated. Derived measures are calculated directly from the UGC counts.

Table A1. Reproducible national series and calculated indicators

Year	Enrollment	Female	Female %	Graduates	G/E %	Teachers	E/T	Campuses	E/C
2016/17	371,184	195,133	52.57%	90,922	24.50%	9,299	39.92	1,408	263.62
2017/18	423,996	222,981	52.59%	88,115	20.78%	9,269	45.74	1,425	297.54
2018/19	441,819	229,961	52.05%	84,510	19.13%	9,269	47.67	1,432	308.53
2019/20	466,828	247,370	52.99%	79,541	17.04%	11,748	39.74	1,437	324.86
2020/21	460,826	242,103	52.54%	37,619	8.16%	11,031	41.78	1,440	320.02
2021/22	579,448	319,337	55.11%	88,902	15.34%	10,916	53.08	1,455	398.25
2023/24	633,053	358,140	56.57%	97,564	15.41%	12,082	52.40	1,432	442.08

Appendix B. Interpretation Rules

Do not interpret G/E as a graduation rate.

Do not interpret enrollment decline as dropout without cohort tracking.

Do not interpret NOC issuance as equivalent to university dropout.

Treat 2020/21 as a potential structural-break year because the graduate series shows a large disruption.

Use institution-level and program-level comparisons to identify where national averages conceal variation.

For future research, link student-level records across admission, progression, examination, transfer, migration and graduation.

Appendix C. Suggested Future Research Model

A future study can estimate a discrete-time hazard model for dropout. For student i in semester t, Pr(D_it=1) = logit^{-1}(α_t + β1 Financial_it + β2 Academic_it + β3 Support_it + β4 Migration_it + β5 Gender_i + β6 Province_i + β7 Institution_i + ε_it). The model can estimate which observable factors are associated with leaving while controlling for semester and institution. A survival curve can then show the proportion of a cohort remaining enrolled over time.

This proposed model is not estimated in the present paper because the necessary student-level longitudinal data are not contained in the national UGC trend table. Presenting the model as a future research design avoids fabricating individual-level evidence while showing how Nepal's statistical system could move toward rigorous causal and predictive analysis.