ORIGINAL ARTICLE

Longitudinal Audit of Research Outcomes in Paediatrics Department, Universiti Sains Malaysia (1991-2024)

Mohamad Syahrain Suhaimi[1,2], Fahisham Taib[1,2], Azizah Othman[1,2]

[1] Department of Paediatrics, School of Medical Sciences, Universiti Sains Malaysia, 16150 Kubang Kerian, Kelantan, Malaysia
[2] Hospital Pakar Universiti Sains Malaysia (HPUSM), Health Campus, Universiti Sains Malaysia, 16150 Kubang Kerian, Kelantan, Malaysia

ABSTRACT

Introduction: Research outcomes are a crucial indicator of academic and clinical performance in medical institutions. Despite routine audits, the overall research outcomes of the Department of Paediatrics, Universiti Sains Malaysia (USM) have not been comprehensively evaluated since the inception of Master of Medicine (MMed) in Paediatrics programme in 1991. The study aimed to analyse research outcome of academic staff and MMed candidates, identifying the trends, and investigating factors associated with research productivity. **Method:** A longitudinal bibliometric audit utilizing departmental records, institutional repositories, and indexed journal databases was undertaken. Publications were categorized by type, authorship role, study design, and funding status. The proportion of MMed dissertations published in indexed publications was calculated. Comparative analysis between 2009–2016 and 2017–2024, were used to detect significant changes. **Results:** A total of 511 publications and 221 completed MMed dissertations were identified over 34 years. Research outcome increased substantially post 2008, corresponding with USM's designation as an Accelerated Programme for Excellence (APEX) university, despite a brief decline in 2018–2019. Approximately 33% of MMed dissertations were published in indexed journals. Senior academic rank, authorship status, original research, and grant-funded projects correlated significantly with higher research productivity ($p < 0.05$). There was notable rise in junior lecturer contributions and shift towards non-original article publications. **Conclusion:** Substantial growth in research productivity has been shown in the Paediatric Department, USM. Strengthening research mentorship, funding accessibility, and postgraduate publication support will be the key to sustaining research excellence and clinical practice innovation.
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Keywords: Research productivity, Bibliometric audit, Postgraduate research, MMed Paediatrics, Universiti Sains Ma-laysia, Academic output

Corresponding Author:
Fahisham Taib, FRCPCH
Email: fahisham@gmail.com
Tel:+609 7676536

INTRODUCTION

When measuring the performance of individuals, departments, or institutions, research outcomes are a significant determining factor that shows evidence of progress in academia. Research outcomes can be referred to as the scholarly outcomes produced by academic staff during a specific time period, including peer-reviewed journal articles, books, monographs, conference proceedings, technical reports, book chapters, theses or dissertations, peer reviews, occasional papers, and patents (1).

Research findings are widely analysed using bibliometric indicators, which encompass the number of publications, authorship roles, and the rank of journals in which articles are indexed, together with the amount of financial assistance successfully obtained. Such evaluations play a crucial role in monitoring academic engagement and growth, including in clinical medicine. Beyond measuring departmental activity, research has broader importance where it enhances institutional visibility and reputation (2, 5), promotes evidence-based clinical practice (3), facilitates collaboration, fosters expert recognition (4, 6), and strengthens postgraduate training by embedding a research culture among faculty and students (1, 6).

To observe trends, identify strengths, and establish standards for future research, numerous countries globally have conducted bibliometric audits to measure their educational and medical institutions' performance. In Pakistan, the medical research outcome exhibited a healthy growth from 1996 to 2012 but began to deteriorate after 2008 (7). Similarly, increment of research outcomes in Saudi Arabia from 2008 to 2017, with an estimated 14.1% average annual

growth rate of research productivity, largely attributed to improvements in education quality, expansion of research and development activities, and consistent budget allocations toward research initiatives (8).

In the East Asia, Choi et al. reported emergency medicine research over two decades (1996 to 2015) has shown a steady growth in original research publications and increased journal diversity (9). Their findings highlighted the importance of structured postgraduate training, effective collaboration across departments, and supportive policies to enhance better research productivity. In contrast, the USA and Western Europe dominated critical care publications during 1995–2003, with Canada and Japan also generating highly cited studies in reputable journals (10). These international and regional patterns underscore the importance of understanding research performance within the Malaysian context.

In 2008, Universiti Sains Malaysia (USM) has been awarded as the country's leading research-intensive university (11). Being the first university to be awarded the Accelerated Programme for Excellence (APEX) university, USM prioritises high-impact research outcomes, innovations, and international recognition. Each academic staff member is expected to contribute to research outcomes and publish in the high-impact and indexed journals. The Department of Paediatrics at USM has been participating in research since the early 1990s, when the Master of Medicine (Paediatrics) programme was introduced. Contributions came from both the lecturers and postgraduate students, particularly those fulfilling the MMed theses as their partial fulfilment of the programme. MMed graduates are required to complete a research project during their 4 years clinical training; however, not all of these dissertations are published.

Several factors were theorised to affect research productivity in the academic domain. These include the academic standing of lecturers, availability of research grants, the study design, and the position in authorship (corresponding, first, or co-author). Studies from numerous regions have shown that the availability of senior academic professionals and those with research funds were more likely to publish in the high-impact journals (12, 8). Nonetheless, it remains uncertain whether the patterns of research productivity can be sustained in the long run for all Malaysian academic institutions.

Additionally, it is known that changes in student intake, academic rules, and faculty assistance could impact the overall research productivity over time. Two critical periods: a) from 2009 to 2016, where the time frame represents the early phase of APEX formation, and b) from 2017 to 2024, where the time frame represents recent developments, including the post-COVID-19 research climate and the expansion of postgraduate enrolment. A comparative analysis can help reveal institutional strengths and possibilities for future capacity building.

This audit examines the research outcomes of the Department of Paediatrics over a 34-year period following the inception of the MMed programme (1991 to 2024). It also assesses the factors that would have contributed to successful research outcomes. The findings provide the baseline for future planning, support benchmarking efforts, and potentially encourage higher research standards and visibility of the department's academic contribution to the School of Medical Sciences and ultimately to the USM Key Performance Index.

MATERIALS AND METHODS

Study Design

The study was conducted retrospectively at the Department of Paediatrics, School of Medical Sciences, Universiti Sains Malaysia. It covered the time frame from 1991 to 31st December 2024, with the aim of evaluating research outcomes produced by academic staff and MMed (Paediatrics) candidates affiliated to the department.

Inclusion and Exclusion Criteria

Research outcomes were the following criteria: (i) completed MMed (Paediatrics) dissertations between 1991 and 2024 or (ii) journal articles published and indexed in recognised academic databases such as Google Scholar, PubMed, ResearchGate, Web of Science, or Scopus. The articles were from either academic staff working at that time or theses which have been accepted as full paper from the MMed (Paediatric) candidates. Incomplete or abandoned dissertation, duplicate entries were removed, and publications in predatory or non-peer-reviewed journals were also excluded. Each publication was counted only once, even if multiple USM-affiliated authors were involved.

Operational Definitions

For this study, research outcomes were operationalized as measurable indicators of academic productivity, specifically the number of publications, the proportion of MMed (Paediatrics) dissertations published in indexed journals, and factors associated with higher publication outcome across two time periods (2009–2016 vs. 2017–2024). This is consistent with bibliometric approaches that evaluate productivity using publication counts and research dissemination in peer-reviewed, indexed journals (1, 5). Original research refers to scholarly work in which the authors present new, investigator-generated findings, including experimental studies (e.g., clinical trials, laboratory-based studies), observational or longitudinal cohort analyses, and other studies generating novel primary data. Manuscripts following the IMRAD structure (Introduction, Methods, Results, and Discussion) typically fall under this category. In contrast, non-original research (or secondary research)

involves work without primary data generation. This includes content such as systematic or narrative reviews, audits, case reports, editorials, commentaries, and protocols (22).

Data Collection

A verified list of academic staff and MMed (Paediatrics) candidates from 1991 to 2024 was obtained directly from the Department of Paediatrics, USM. Manual data extraction was carried out using a standardized pro forma to ensure consistency and reliability. The data collection process utilised multiple reputable academic databases and search engines, including Google Scholar, PubMed, Web of Science, ResearchGate, and Scopus. The search strategy incorporated three key elements: researcher identification verified through Scopus author profiles, subject classification based on the term "Paediatrics" using the Medical Subject Headings (MeSH) database, and institutional affiliation identified using keywords such as "Department of Paediatrics" and "Universiti Sains Malaysia". For each eligible publication, the following information was extracted: year of publication, author names, research title, type of publication (e.g., original article, review, case report), authorship role (first author, corresponding author, or co-author), and funding status (funded or non-funded).

Data Analysis

All data were cleaned and analysed using IBM SPSS Statistics (Version 29). Microsoft Excel was used for generating graphical illustrations of trends. Data were screened for completeness and accuracy before statistical analysis. Descriptive statistics (counts and percentages) were used to summarise the annual number of research outcomes. Counts and percentages were calculated, and results were tabulated by year. The number of completed MMed dissertations and the number of subsequently published dissertations in indexed journals (PubMed, Scopus, Web of Science) were tabulated. The proportion of dissertations resulting in indexed publications was calculated and presented as a percentage of the total MMed dissertations completed.

Data were stratified into two time periods (2009–2016 and 2017–2024) to assess temporal changes in productivity and associated factors. For continuous outcomes, an independent t-test was applied to compare the mean number of publications between junior and senior lecturers within each period. The independent t-test was applied for continuous data, assuming approximate normal distribution based on the nature of the data. The results were reported as mean ± standard deviation (SD) with 95% confidence intervals (CI) for the mean difference. A non-significant p-value indicated no statistical difference between the groups. For categorical outcomes, Pearson's chi-square test was used to look for associations between the categorical factors (academic rank, research type, authorship role, funding status) and study period. When expected cell counts were less than five, Fisher's exact test was applied to maintain statistical validity. Effect size was not within the primary scope of this audit; however, chi-square statistics (χ^2), degrees of freedom (df), and p-values were reported for transparency. All statistical tests were two-tailed, and a p-value < 0.05 was considered statistically significant.

RESULTS

In total, 39 academic staff and 313 MMed (Paediatrics) candidates were identified during this period (1991 to 2024). Over the 34 years, a total of 511 publications were recorded from the Department of Paediatrics, USM. The annual outcome increased gradually in the early years, ranging from 1 (in 1991 and 2002) to 59 (in 2024), with the average annual outcome in 2009-2016 being 19.6 and in 2017-2024 being 33.8. The overall trend demonstrated a steady increase in the number of research outcomes over time, with a sharper rise after 2008, coinciding with the university's APEX status designation. A temporary decline was noted in 2018–2019, after which publication numbers surged from 2020 onwards (Figure 1).

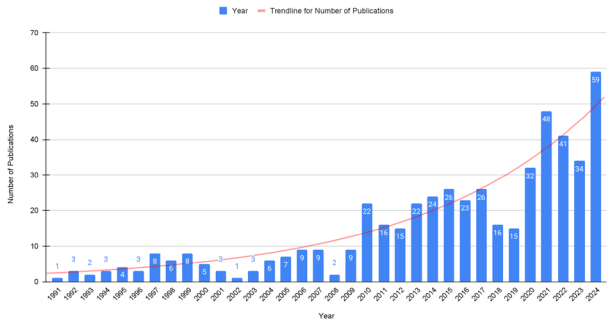

Figure 1: Research Outcome Trends in the Department of Paediatrics, HPUSM (1991–2024)

Across the entire study period (1991–2024), the mean number of publications per lecturer was 13.1. The mean was 6.38 during the pre-APEX period (1991–2008), 6.8 during the early post-APEX period (2009–2016), and 10.4 during the later post-APEX period (2017–2024). From the 313 MMed (Paediatrics) students identified within these years, a total of 221 MMed (Paediatrics) dissertations were completed. Of these, 72 were subsequently published in indexed journals, representing a publication proportion rate of 32.6%. This indicates that approximately one-third of postgraduate dissertations were successfully converted into peer-reviewed outcomes.

In terms of faculty involvement as research outcomes, lecturer participation expanded across the three major timeframes. During the pre-APEX period (1991–2008), 13 lecturers were active (11 seniors, 2 juniors). In the early post-APEX period (2009–2016), the number has increased to 23 lecturers (17 seniors, 6 juniors). By the later post-APEX period (2017–2024), 26 lecturers were in the office and contributed (14 seniors, 12 juniors) to the research outcomes. This reflects both an expansion

of academic staff and a greater proportion of junior lecturers in more recent years (Table I).

Table I: Distribution of Lecturers by Academic Rank in the Department of Paediatrics, HPUSM (1991–2024)

Year	Junior Lecturers (n)	Senior Lecturers (n)	Total Lecturers (n)
1991- 2008	2	11	13
2009-2016	6	17	23
2017-2024	12	14	26

Note: Junior lecturers were defined as academic staff below Associate Professor rank (e.g., Lecturer, Senior Lecturer). Senior lecturers were defined as those holding Associate Professor or Professor positions.

Original research, refers to scholarly work in which the authors present new, investigator-generated findings, including experimental studies, accounting for 304 publications (59.5%). Non-original, that is research work without primary data generation, made up 207 publications (40.5%). Among original research, observational studies were the most frequent (n = 120; 39.5%), followed by laboratory/basic science studies (n = 56; 18.4%), epidemiological studies (n = 35; 11.5%), and health services research (n = 29; 9.5%). Randomized controlled trials (RCTs) (n = 28; 9.2%), qualitative research (n = 17; 5.6%), case series (n = 16; 5.3%), and pilot studies (n = 3; 1.0%) formed the remainder. Non-original research was largely comprised of case reports (n = 108; 52.2%), followed by, editorials or commentaries (n = 43; 20.8%), narrative reviews (n = 23; 11.1%), miscellaneous outcomes such as guidelines or consensus statements (n = 21; 10.1%), and systematic reviews and meta-analyses (n = 12; 5.8%) (Table II).

Several factors were studied to find differences between the two periods (Table III). There was a statistically significant association between academic rank status and time-period, $\chi^2(1) = 42.345$, $p < 0.001$, Cramer's V = 0.315 (moderate association). The proportion of junior authors increased markedly from 21.7% in Period 1 (2009–2016) to 53.9% in Period 2 (2017–2024), while the proportion of senior authors decreased from 78.3% to 46.1% over the same periods. The outcomes of original research decreased from 66.5% in Period 1 (2009–2016) to 55.9% in Period 2 (2017–2024), $\chi^2(1) = 4.598$, $p = 0.032$, Cramer's V = 0.104 (small association). Otherwise, the proportion of non-original research from Period 1 to Period 2 increased from 33.5% to 44.1%. There was a statistically significant association between authorship role and time period, $\chi^2(2) = 6.056$, $p = 0.048$, Cramer's V = 0.119 (small association), with an increase in corresponding authorship proportion from 20.4% in Period 1 to 31.4% in Period 2. Additionally, a statistically significant association was also observed between funding status and time period, $\chi^2(1) = 9.974$, $p = 0.002$, Cramer's V = 0.153 (small-to-moderate association). The proportion of publications with grant support decreased from 17.8% in Period 1 to 7.7% in Period 2, whereas those without grant support increased from 82.2% to 92.3% (Table IV).

Table II: Distribution of Research Publication Types in the Department of Paediatrics, HPUSM (1991–2024)

Research Type	1991-2008	2009-2016	2017-2024	Total (n) %
Original (n)				
Randomized Controlled Trial	3	4	21	28 (9.2)
Observational	13	34	73	120 (39.5)
Laboratory/ Basic Science	12	33	11	56 (18.4)
Epidemiological	8	13	14	35 (11.5)
Qualitative	1	11	5	17 (5.6)
Case Series	7	2	7	16 (5.3)
Health Services	4	6	19	29 (9.5)
Pilot	0	2	1	3 (1.0)
Non-original (n)				
Systematic Review/ Meta-analysis	0	4	8	12 (5.8)
Case Reports	22	13	73	108 (52.2)
Narrative Review	6	8	9	23 (11.1)
Editorial/ Commentaries	5	15	23	43 (20.8)
Miscellaneous	2	13	6	21 (10.1)

Note: Research type was classified according to the International Committee of Medical Journal Editors (ICMJE) Recommendations (2024). Original research included outputs reporting new investigator-generated data (e.g., observational studies, interventional trials, laboratory-based studies, and cohort analyses). Non-original research included outputs not generating primary data (e.g., case reports, reviews, editorials, commentaries, and protocols). Total publications represent the sum of original and non-original works.

DISCUSSION

This 34-year longitudinal audit (1991–2024) is the first comprehensive review of research outcomes from the Department of Paediatrics, Universiti Sains Malaysia (USM). The study showed publication trends, the conversion rate of MMed (Paediatrics) dissertations into indexed publications, and factors associated with higher research outcomes across two time periods (2009–2016 and 2017–2024).

A total of 511 publications were produced during 1991–2024, and 221 MMed (Paediatrics) dissertations were completed in the same period. These categories represent different forms of research outcome indicating the department's scholarly productivity, whereas dissertations denote postgraduate academic work, of which only a portion is subsequently published. Overall, the department's research outcome showed

Table III: Mean Number of Publications Per Lecturer by Period and Academic Rank in the Department of Paediatrics, USM

Period	Academic Rank	n	Mean (SD)	p-value	*t*-value	df	95% CI (Lower, Upper)
2009-2016	Junior	6	5.67 (6.65)	0.686	-0.450	21	-9.52, 6.38
2009-2016	Senior	17	7.24 (8.44)				
2017-2024	Junior	12	11.92 (17.16)	0.621	0.501	24	-8.66, 14.21
2017-2024	Senior	14	9.14 (10.82)				

Note: Independent t-test was applied to compare the mean publications between junior and senior lecturers within each period.

Table IV: Comparison of Factors Associated with Publication Output in the Department of Paediatrics , USM, between Period 1 (2009-2016) and Period 2 (2017-2024)

Factor	Category	Period 1 (2009-2016), n (%)	Period 2 (2017-2024), n (%)	χ^2 (df)	Cramer's V	p-value
Academic Rank	Junior	34 (21.7)	146 (53.9)	42.345 (1)	0.315	<0.001
	Senior	123 (78.3)	125 (46.1)			
Research Type	Original	105 (66.5)	151 (55.9)	4.598 (1)	0.104	0.032
	Non-original	53 (33.5)	119 (44.1)			
Authorship Role	Corresponding author	32 (20.4)	85 (31.4)	6.056 (2)	0.119	0.048
	First author	12 (7.6)	17 (6.3)			
	Co-author	113 (72.0)	169 (62.4)			
Funding Status	Grant	28 (17.8)	21 (7.7)	9.974 (1)	0.153	0.002
	No grant	129 (82.2)	250 (92.3)			

an upward trajectory, with a marked increase following the introduction of the APEX initiative in 2008, which emphasised high-impact research, international visibility, and sustainable transformation of higher education (11). This pattern is consistent with those findings from Pakistan (7) and Saudi Arabia (8), where targeted policy reforms and research funding priorities contributed to steady growth in publication outcome.

The relatively low average outcome in the pre-APEX period likely reflects both lower manpower availability and limited institutional emphasis on research at that time. The modest rise during the early post-APEX years corresponds with the university's APEX initiative, which increased expectations and opportunities for research productivity. The sharper increase in the later period may be explained by a higher proportion of junior lecturers actively contributing to publications and factors such as the COVID-19 pandemic, which facilitated retrospective and review-based studies.

Throughout the entire study period (1991–2024), the mean number of publications per lecturer was 13.1. The average outcome was relatively low during the pre-APEX period (1991–2008) at 6.38, reflecting both limited manpower and a lower institutional emphasis on research. A modest rise to 6.8 was observed during the early post-APEX years (2009–2016), coinciding with the implementation of the APEX initiative, which increased expectations and opportunities for research productivity (11). The sharper increase in the later period (2017–2024), with a mean of 10.4 publications per lecturer, may be explained by the expanding proportion of junior lecturers actively contributing to publications (12, 14, 21), as well as factors such as the COVID-19 pandemic, which created opportunities for retrospective and review-based studies (13, 16, 17).

In terms of lecturer distribution, the study demonstrated a steady increase in the number of academic staff contributing to research, from 13 in the pre-APEX period (1991-2008) to 26 in the later post-APEX period (2009-2024). Notably, the proportion of junior lecturers increased substantially in the most recent years.

This expansion reflects both workforce growth and generational renewal within the department. Similar patterns have been observed internationally, where junior faculty contributed to higher outcome volume but required structured mentorship and institutional support to sustain quality research productivity (12, 15, 21). This highlights the importance of embedding mentorship programmes and research networks to support early-career paediatricians.

Original research comprised nearly 60% of all outcomes, with observational studies forming the largest subgroup. This aligns with bibliometric studies from other countries globally, where observational research was most frequent due to its feasibility, lower resource demands, and clinical relevance (7, 9, 10). However, the relatively small proportion of randomized controlled trials reflects the challenges to conducting resource-intensive interventional studies in local settings, similar observations to All India Institute of Medical Sciences (18). Non-original research, particularly case reports, constituted a substantial share of the outcomes. Although considered lower in the evidence hierarchy, case reports remain important in paediatrics for describing rare conditions, generating hypotheses, and enhancing clinical knowledge (18, 19).

The authorship role distribution highlights another important trend. Co-authorship was the most frequent pattern throughout the study period, reflecting a strong culture of collaborative research (4, 5). However, an increase in corresponding authorship indicates more departmental staff are taking leadership roles in research projects and accepting university calls for leading the study (12, 14, 15). This development is encouraging, as corresponding authorship is often linked with accountability and recognition at institutional and international levels. In contrast, first authorship remained relatively low, which may reflect the challenges faced by early-career staff in leading research projects amid clinical responsibilities. Encouraging greater first-author opportunities for junior staff could enhance individual academic progression and departmental visibility.

A slight decline in publication numbers was noted from 2018 to 2019, which could be related to factors such as changes in staff composition (including turnover and compulsory retirements), reduced funding opportunities, or a temporary shift in research priorities (4, 21). Interestingly, a surge in publications occurred from 2020 onwards, coinciding with the COVID-19 pandemic period. This rise is consistent with reports from other disciplines, where reduced clinical workloads in early pandemic phases allowed more time for manuscript preparation, research shifted towards retrospective data analysis and review-based studies and expanded use of virtual collaboration platforms provided opportunities for enhanced academic writing and publication outcome (16, 17).

Of the 221 MMed (Paediatrics) dissertations completed, 72 (32.6%) were subsequently published in indexed journals. While this represents a meaningful contribution, the conversion rate is lower than that reported in some postgraduate programmes internationally (18, 19). Several factors likely contribute to this gap, including the graduates transitioning into full-time clinical practice immediately after thesis submission, leaving limited time either for initial manuscript preparation or for revising and resubmitting after rejections from the first submitted journals (20). Additionally, supervisors and graduates may prioritise ongoing or funded projects over converting older dissertations into publications (13, 14). Previous studies have shown that structured research-writing support and post-thesis mentorship can improve dissertation-to-publication conversion rates (15). Thus, implementing similar initiatives within the department, such as writing workshops, publication awards, and defined timelines for post-thesis submission, could improve this performance indicator and enhance the department's academic visibility (17).

The proportion of outcomes from junior lecturers has increased significantly in 2017–2024 compared to 2009–2016. This shift may reflect changing departmental demographics, possibly due to increased recruitment trends of research-active early-career academics and stronger probationary requirements for research outcome (21, 20). Similar trends have been reported in other academic settings, where structured mentorship and early integration into research networks have enhanced junior faculty contributions (19).

The proportion of original research decreased significantly in the later period, with a corresponding rise in non-original studies such as audits, reviews, and case reports. This shift may be attributed to reduced availability of grants (13), greater time constraints (1), or a preference for smaller, faster-to-complete studies. While non-original studies can still provide valuable contributions to clinical knowledge (18), a balanced portfolio that maintains a strong proportion of original research is important for sustaining international competitiveness (15).

Strengths and limitations

A major strength of this study is its long-term scope, covering over three decades of departmental research with triangulated data sources, including departmental archives, library records, and indexed publication databases (18). However, limitations include possible underestimation of early-period outcomes due to incomplete records and the exclusion of non-indexed publications that may still have academic value (1). Other than that, authorship role classifications also relied on available metadata, which may not fully capture collaborative contributions (14).

Future directions

Future research should incorporate citation analysis and journal impact metrics to assess the reach and influence of departmental outcomes more comprehensively (15). Qualitative studies exploring barriers to MMed (Paediatrics) dissertation publication (20) could provide actionable insights for supportive strategies. Expanding collaborative networks, particularly international partnerships, may also strengthen research capacity, diversity, and visibility (19).

CONCLUSION

This longitudinal audit of the Department of Paediatrics, USM, spanning 1991–2024, provides the first comprehensive overview of the department's research outcomes. Overall, research outcome increased notably following USM's APEX University designation, with a brief downturn in 2018–2019 and a marked surge from 2020 onwards. The proportion of MMed (Paediatrics) dissertations that progressed to indexed publications highlights both existing strengths and areas requiring targeted support, particularly in improving conversion rates. Factors such as academic rank, research funding, type of study, and authorship role were associated with higher research outcome, in line with global and regional trends. These findings underscore the need for sustained mentorship, broader funding opportunities, and strategic collaborations to enhance research visibility, capacity building, and academic impact.

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