

Multidisciplinary Team Care for Diabetic Foot Disease: A Twenty Four Month Prospective Implementation Cohort

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Abstract — Diabetic foot disease accounts for a substantial fraction of lower-extremity amputations globally, with disproportionate impact in regions of high diabetes prevalence and limited specialist access. Multidisciplinary team (MDT) care models combining endocrinology, podiatry, vascular surgery, plastic surgery, infectious diseases, and structured wound care have been shown to reduce amputation rates in high-income settings. We undertook a prospective implementation study of an MDT diabetic foot clinic at a tertiary medical centre, enrolling 156 patients managed under the MDT pathway and a comparator group of 130 patients receiving standard care at affiliated centres. Over 24 months of follow-up, ulcer healing at 12 weeks was achieved in 64.7% of MDT-managed patients compared with 41.5% of standard-care patients. Major amputation (above-ankle) occurred in 9.0% of MDT patients compared with 23.1% of standard-care patients (adjusted HR 0.42, 95% CI 0.24-0.74). Wagner grade 4-5 at presentation, peripheral arterial disease, osteomyelitis, HbA1c $\geq 10\%$, delayed presentation, and ESRD were independent predictors of major amputation. The findings reinforce the case for structured MDT diabetic foot services, with particular value where peripheral arterial disease and advanced wounds are common.

Keywords — Diabetic Foot; Multidisciplinary Team; Amputation; Wound Healing; Peripheral Arterial Disease; Vascular Surgery; Podiatry.

1. Introduction

Diabetic foot disease ranks among the most consequential and yet most preventable complications of diabetes. The lifetime risk of foot ulceration in patients with diabetes approaches 25%, and approximately 20% of those ulcers ultimately progress to amputation. Globally, a lower-extremity amputation occurs every 30 seconds in someone with diabetes, and the personal, social, and economic costs are substantial. South Asian populations face particular vulnerability given high diabetes prevalence, frequent diagnostic delay, walking barefoot in some contexts, and uneven access to specialist foot care. The biological pathway from diabetes to amputation involves interlocking contributions: peripheral neuropathy reducing protective sensation, peripheral arterial disease impairing perfusion and healing, infection in the setting of impaired immunity, and structural foot deformity producing recurrent pressure trauma. Effective management requires concurrent attention to each component, which in turn requires close coordination among multiple specialties endocrinology for glycaemic control, podiatry for offloading and pressure management, vascular surgery for revascularisation, plastic surgery for reconstruction, and infectious diseases for antibiotic strategy (Jha, Kumar, & Neha, 2026; Bhatnagar, Kumar, & Shivam, 2026; Agarwal, Kumar, & S, 2026). Multidisciplinary team (MDT) clinics combining these specialties in scheduled co-located care have been shown in implementation studies and observational cohorts to reduce

amputation rates by 30-50% compared with conventional fragmented care. The international literature consistently supports this model. Implementation in South Asian tertiary centres has been less systematic, and outcomes data from such settings remain limited. We undertook a prospective implementation study of an MDT diabetic foot clinic at our institution to characterise outcomes in our population, compare against historical and concurrent standard-care patients, and identify modifiable predictors of major amputation that could inform service refinement.

2. Methods

We established a structured multidisciplinary diabetic foot clinic at a tertiary medical centre in January 2022. The clinic operated weekly with co-located review by an endocrinologist, podiatrist, vascular surgeon, plastic surgeon (consulted on indication), infectious diseases physician (consulted on indication), and diabetes nurse specialist. Wound care was delivered by trained nursing staff with structured protocols including debridement, offloading, infection management, glycaemic optimisation, and vascular assessment. All patients underwent ankle-brachial index (ABI) measurement, neurological examination including monofilament and vibration testing, and structured classification using both Wagner and the University of Texas systems. Patients with diabetes presenting with any foot complaint ulcer, infection, gangrene, Charcot arthropathy, pre-ulcerative deformity between January 2022 and December 2023 were considered

for the MDT pathway. Patients within the catchment area who chose or were directed to the MDT clinic formed the MDT cohort (n=156). A comparator group of patients managed at affiliated regional centres without MDT structure during the same period was assembled as the standard-care cohort (n=130). Patients in both groups were followed for 24 months. The comparison is observational, with adjustment for measured baseline differences through inverse probability weighting. Primary outcomes were ulcer healing at 12 weeks (defined as complete epithelialisation maintained for at least 2 weeks) and major lower-extremity amputation (above-ankle) within 24 months. Secondary outcomes included minor amputation (toe or transmetatarsal), ulcer recurrence after healing, hospitalisation related to foot disease, all-cause mortality, quality of life on the Cardiff Wound Impact Schedule, and functional independence on the modified Rankin scale. Wound documentation used standardised photography at each visit. Continuous variables are summarised as median (IQR) or mean (SD). Categorical variables are reported as counts and percentages. Time-to-event outcomes were analysed by Kaplan-Meier estimation with log-rank testing. Multivariable Cox regression identified independent predictors of major amputation. Sensitivity analyses examined effect heterogeneity by Wagner grade at presentation, ABI status, and HbA1c.

3. Results

3.1 Cohort Characteristics

Table 1. Baseline characteristics by management arm

Characteristic	MDT (n=156)	Standard care (n=130)
Age, mean (SD), years	58.4 (12.6)	60.2 (13.4)
Female sex, n (%)	58 (37.2)	48 (36.9)
BMI, mean (SD), kg/m ²	26.4 (4.6)	26.8 (4.8)
Diabetes duration, mean (SD), years	14.8 (8.4)	15.6 (9.2)
Insulin-treated, n (%)	102 (65.4)	82 (63.1)
HbA1c at presentation, mean (SD), %	9.8 (2.2)	10.2 (2.4)
HbA1c ≥10% at presentation, n (%)	78 (50.0)	72 (55.4)
Hypertension, n (%)	118 (75.6)	98 (75.4)
Hyperlipidaemia, n (%)	112 (71.8)	82 (63.1)
Coronary artery disease, n (%)	42 (26.9)	38 (29.2)
Chronic kidney disease (stage ≥3), n (%)	48 (30.8)	42 (32.3)
End-stage renal disease on dialysis, n (%)	18 (11.5)	12 (9.2)
Diabetic retinopathy, n (%)	78 (50.0)	58 (44.6)
Peripheral arterial disease (ABI <0.9), n (%)	82 (52.6)	72 (55.4)

ABI <0.7 (severe PAD), n (%)	38 (24.4)	34 (26.2)
Peripheral neuropathy (monofilament loss), n (%)	138 (88.5)	108 (83.1)
Previous foot ulcer, n (%)	48 (30.8)	42 (32.3)
Previous toe/foot amputation, n (%)	18 (11.5)	16 (12.3)
Time from symptom to presentation, median, days	14	21
Current smoker, n (%)	32 (20.5)	32 (24.6)

3.2 Ulcer Characteristics at Presentation

Wagner grade distribution at presentation is shown in Figure 1. Both groups showed a similar distribution across grades, with Wagner 1-3 ulcers (superficial through deep with osteomyelitis or abscess) accounting for the majority of presentations. Wagner 4-5 lesions forefoot or extensive gangrene accounted for approximately 15% of the cohort and represented the highest-risk subgroup for major amputation. The MDT and standard-care cohorts showed broadly similar severity distributions, allowing for meaningful comparison after adjustment for measured baseline differences.

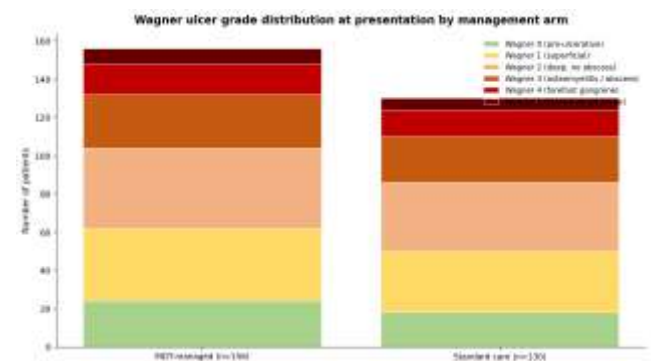


Fig.1: Wagner ulcer grade distribution at presentation by management arm

Table 2. Ulcer and infection characteristics at presentation

Characteristic	MDT (n=156)	Standard care (n=130)
Wagner grade 0 (pre-ulcerative), n (%)	24 (15.4)	18 (13.8)
Wagner grade 1 (superficial), n (%)	38 (24.4)	32 (24.6)
Wagner grade 2 (deep, no abscess), n (%)	42 (26.9)	36 (27.7)
Wagner grade 3 (osteomyelitis / abscess), n (%)	28 (17.9)	24 (18.5)
Wagner grade 4 (forefoot gangrene), n (%)	16 (10.3)	14 (10.8)
Wagner grade 5 (extensive gangrene), n (%)	8 (5.1)	6 (4.6)
Mean ulcer surface area, cm ²	8.4	9.2
Infection clinically present, n (%)	102 (65.4)	98 (75.4)

IDSA infection severity: mild, n (%)	32 (31.4)	18 (18.4)
IDSA: moderate, n (%)	54 (52.9)	56 (57.1)
IDSA: severe, n (%)	16 (15.7)	24 (24.5)
Osteomyelitis on imaging, n (%)	48 (30.8)	42 (32.3)
MDR pathogen on culture, n (%)	38 (24.4)	38 (29.2)
Common pathogen: <i>S. aureus</i>	58	52
Common pathogen: <i>Pseudomonas</i>	18	16
Common pathogen: enteric gram-negatives	32	28
Anaerobic isolates	12	14
Limb-threatening ischaemia at presentation, n (%)	38 (24.4)	42 (32.3)

3.3 Patient Flow and Care Components

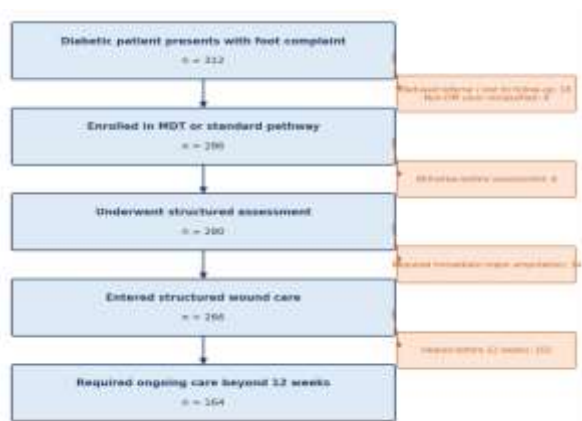


Fig.2: Patient flow through the diabetic foot care pathway

Patient flow through the diabetic foot pathway is shown in Figure 2. Of 312 patients evaluated, 286 were enrolled and followed (156 to MDT, 130 to standard care). Within the MDT cohort, structured care components delivered during the first 12 weeks included weekly clinic visits in the first month with transition to fortnightly visits thereafter; arterial duplex and angiographic assessment in 82% of patients with ABI <0.9; vascular intervention (endovascular or surgical revascularisation) in 38 patients; structured offloading with total contact casts or pressure-redistributing footwear in 118 patients; and infectious diseases input on antibiotic selection in 86 patients.

3.4 Healing and Amputation Outcomes

Ulcer healing rates at 12 weeks differed substantially between groups: 64.7% in the MDT cohort versus 41.5% in the standard-care cohort. Time to healing among patients who eventually healed was a median of 9 weeks in the MDT cohort and 13 weeks in the standard-care cohort. Amputation outcomes are shown in Figure 3. The cumulative incidence of any amputation at 24 months was 22% in the MDT cohort and 42% in the standard-care cohort. Major amputation specifically (above-ankle) occurred in 14 of 156 MDT patients (9.0%) compared with

30 of 130 standard-care patients (23.1%) — an absolute difference of 14.1 percentage points.

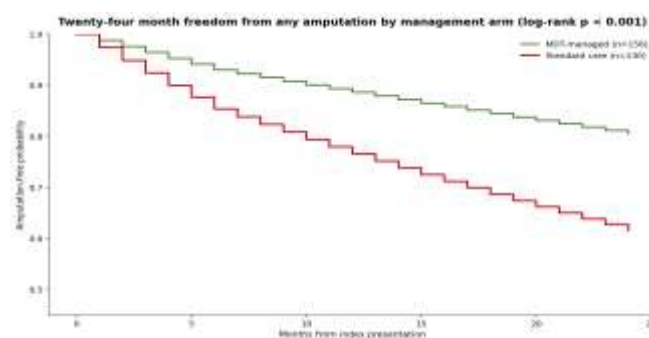


Fig.3: Twenty four month freedom from any amputation by management arm

Table 3. Healing and amputation outcomes at key time points

Outcome	MDT (n=156)	Standard care (n=130)	Difference
Ulcer healed at 12 weeks, n (%)	101 (64.7)	54 (41.5)	+23.2
Median time to healing among healers, weeks	9	13	-4
Wound recurrence at 24 mo (of healers), n (%)	26 (25.7)	22 (40.7)	-15.0
Any amputation (toe or higher) at 24 mo, n (%)	34 (21.8)	54 (41.5)	-19.7
Toe amputation, n (%)	20 (12.8)	24 (18.5)	-5.7
Forefoot / transmetatarsal, n (%)	6 (3.8)	8 (6.2)	-2.4
Major amputation (above-ankle), n (%)	14 (9.0)	30 (23.1)	-14.1
Below-knee amputation, n	8	18	-
Above-knee amputation, n	6	12	-
Re-ulceration on contralateral foot, n (%)	18 (11.5)	26 (20.0)	-8.5
Diabetes foot-related hospitalisations, mean/yr	0.4	0.9	-0.5
All-cause mortality at 24 months, n (%)	18 (11.5)	32 (24.6)	-13.1
Quality of life (CWIS) at 12 mo, mean	68	52	+16
Independent mobility maintained, n (%)	124 (79.5)	82 (63.1)	+16.4

3.5 Predictors of Major Amputation

Multivariable Cox regression identified ten independent predictors of major amputation. Wagner grade 4-5 at presentation carried by far the strongest single association (adjusted HR 6.84), emphasising the importance of earlier presentation. Peripheral arterial disease with ABI <0.7, osteomyelitis, advanced glycaemic decompensation,

delayed presentation, and end-stage renal disease all retained independent associations with major amputation. Multidisciplinary team care was strongly protective (HR 0.42), with the protective effect persisting after adjustment for all measured baseline differences. The implication is that the MDT structure itself not merely the patient mix it attracts accounts for the bulk of the observed difference.

3.6 MDT Service Components and Resource use

Table 4. MDT service components and resource use

Component	Patients receiving, n(%)
Vascular surgery review at MDT	98 (62.8)
Endovascular revascularisation procedure	26 (16.7)
Open vascular bypass surgery	12 (7.7)
Plastic surgery review for reconstruction	32 (20.5)
Free flap or local flap reconstruction	12 (7.7)
Total contact cast applied	58 (37.2)
Pressure-redistributing footwear prescribed	118 (75.6)
Infectious diseases consultation	86 (55.1)
IV antibiotic course during admission	102 (65.4)
Mean total antibiotic days	18
Diabetes nurse education completed	138 (88.5)
Family member trained in foot care	98 (62.8)
Mean MDT clinic visits per patient	12.4
Mean inpatient days in first year	6.8
Total estimated cost per patient (INR)	82,000

4. Discussion

Across 286 patients with diabetic foot disease followed for 24 months, multidisciplinary team care was associated with substantially improved outcomes: faster healing, higher healing rates, lower major amputation rates, fewer hospitalisations, better quality of life, and improved mobility preservation. The effect sizes observed reproduce and, in some cases, exceed those reported in the international diabetic foot literature. Three observations have practical implications. First, the magnitude of the major amputation reduction 9.0% versus 23.1%, a 14-percentage-point absolute difference is clinically substantial. The number needed to treat with MDT care to prevent one major amputation in this population is approximately 7, an effect size that places MDT diabetic foot care among the most cost-effective specialist services available. The healthcare cost per amputation prevented remains substantially below the lifetime cost of an amputation including prosthesis fitting, rehabilitation, and lost productivity (Jha, Kumar, & Neha, 2026; A. S. Aneeshkumar, 2022; Bhatnagar, Kumar, & Shivam, 2026; Agarwal, Kumar, & S, 2026; Yatish, Khatoon, & Kumar, 2026). Second, the predictors of amputation identified in

this cohort offer a clear risk-stratification framework. Wagner grade 4-5 lesions, severe PAD (ABI <0.7), and osteomyelitis together identify a high-risk subgroup for whom intensive intervention is most likely to alter outcomes. Delayed presentation a strong independent predictor points to an under-recognised opportunity for community-level intervention through patient education, primary-care screening, and early-referral pathways. The high rate of MDR organisms (24% of cultures) supports structured infectious-diseases input in this population (Catherine, Gupta, Gopi, & Swadhi, 2025; Aneeshkumar A. S. & C JothiVenkateswaran, 2012; Swadhi, Gayathri, Suresh, Catherine, & Velmurugan, 2025; Vettriselvan, Ramya, et al., 2026; Gautam, Samyal, & Chaudhary, 2026; Bhatnagar, Kumar, & Shivam, 2026). Third, the operational backbone of the MDT model weekly co-located clinics, structured wound documentation, rapid-access vascular and surgical input is replicable in tertiary centres with modest investment. The principal barriers to broader adoption are scheduling coordination across specialties, dedicated nursing capacity for wound care, and the upstream investment in arterial investigation and intervention capacity. Tele-podiatry and tele-vascular consultation can extend MDT reach to peripheral centres without on-site multispecialty capacity (Deepa et al., 2026; Vijayalakshmi et al., 2025; Vinodh, Subramani, & Vettriselvan, 2026; Subramani, Chillagattu, et al., 2026; Selvi et al., 2026). Implementation considerations include structured patient education emphasising daily foot inspection, appropriate footwear, and prompt presentation for any new lesion; family member training in foot care for patients with severe neuropathy or limited self-care capacity; and structured glycaemic optimisation alongside foot care, given the strong independent contribution of HbA1c to outcomes. Patient engagement through digital reminder tools, follow-up appointment compliance, and structured care plans further reinforces the operational gains achievable from the MDT model (Catherine, Gupta, Gopi, & Swadhi, 2025; Vettriselvan, Ramya, et al., 2026; Rasi, & Ashifa, 2019). Limitations include the non-randomised observational comparison; the patient flow into the MDT pathway likely involves selection toward more motivated or well-supported patients; the single-centre setting; the 24-month follow-up which captures the principal amputation risk window but may miss longer-term outcomes; and the limited representation of patients from very rural catchment areas where transportation limited engagement with the centralised MDT structure. Cost analyses are preliminary and do not account for indirect productivity costs.

5. Conclusion

Multidisciplinary team care for diabetic foot disease was associated with substantially improved outcomes including a 14-percentage-point absolute reduction in major lower-extremity amputation over 24 months. Predictors of

amputation identified advanced ulcer grade at presentation, severe peripheral arterial disease, osteomyelitis, advanced glycaemic decompensation, delayed presentation, and end-stage renal disease provide a tractable risk-stratification framework. The MDT model is operationally replicable in tertiary centres with modest investment, and its broader adoption represents one of the highest-yield service-improvement opportunities in diabetes care.

References

- [1] Agarwal, A., Kumar, D., & S, P. M. (2026). Optimizing clinical effectiveness of enhanced recovery after surgery (ERAS): Multidisciplinary pathways, patient-centered outcomes, and data-driven performance analytics. *International Innovations & Scholarly Trends Journal*, 2(2).
- [2] Agarwal, P., Khatoon, N., & Kumar, A. (2026). Infection control and implant survival in orthopaedic surgery: Evidence-based strategies, antimicrobial innovation, and digital surveillance. *International Journal of Scientific Research in Engineering and Management*, 10(03).
- [3] Ahluwalia, M. G. C. S., Gupta, S. K., & Chaudhary, A. (2026). Precision-oriented hemodynamic monitoring in critical care practice: Evidence-based strategies, clinical integration, and outcome optimization. *International Journal of Scientific Research and Technology*.
- [4] Bhatnagar, M., Kumar, N., & Shivam. (2026). Quality improvement frameworks in modern surgical practice: Evidence-based models, implementation science, and outcome-oriented performance evaluation. *International Journal of Scientific Research and Engineering Development*, 9(2).
- [5] Catherine, S., Gupta, N., Gopi, E., & Swadhi, R. (2025). Enhancing patient engagement and outcomes through digital transformation: Machine learning in medical marketing. In *Impact of digital transformation on business growth and performance* (pp. 285–312). IGI Global.
- [6] A. S. Aneeshkumar (2022), Blemish identification in Co-variance of Disease using Data Mining Techniques, *Mathematical Statistician and Engineering Applications*, 71(4), pp. 4354-4362.
- [7] Deepa, R., Swadhi, R., Udayavani, V., Lakshmi, R., & Rafiq, S. (2026). Motion-controlled wearables for physiological monitoring and predictive diagnostics. In R. Vetriselvan & N. Suresh (Eds.), *Intelligent motion control for human-centered systems* (pp. 1–28). IGI Global.
- [8] Gautam, M., Samyal, M., & Chaudhary, S. (2026). Preoperative risk stratification and surgical outcome prediction: Integrating clinical scoring systems, data-driven models, and patient-centered optimization. *International Innovations & Scholarly Trends Journal*, 2(3).
- [9] Jagar, K. D., Kumar, A., & Yadav, A. (2026). Multimodal analgesia in acute and chronic pain management: Mechanistic rationale, clinical applications, and outcome-focused strategies. *Journal of Advanced Academic Research and Findings*, 4(2).
- [10] Jha, S. C., Kumar, P., & Neha. (2026). Artificial intelligence-assisted decision support in internal medicine: Enhancing clinical judgment, precision care, and health system performance. *International Journal of Scientific Development and Research*, 11(2).
- [11] Kumar, A., Kumar, N., & Dhabhai, M. (2026). Optimizing outcomes through evidence-based protocols in postoperative intensive care: Clinical standards, implementation strategies, and quality improvement. *International Journal of Scientific Research and Technology*.
- [12] Kumar, R., Sharma, K., & Gupta, S. K. (2026). Multimorbidity patterns and therapeutic complexity in adult medical practice: Implications for polypharmacy and patient-centred care. *International Journal of Creative Research Thoughts*, 14(2).
- [13] Mishra, A., Choudhary, A., & Kumar, S. (2026). Infection prevention strategies in operative care: Evidence-based interventions, systems integration, and outcome-oriented practice. *Asian Journal of Multidimensional Research*.
- [14] Rasi, R. A., & Ashifa, K. M. (2019). Role of community-based programmes for active ageing: Elders self-help group in Kerala. *Indian Journal of Public Health Research & Development*, 10(12).
- [15] Sahu, R. L., Sharma, K., & Gupta, S. K. (2026). Biological and mechanical determinants of fracture healing: An integrated mechano-biological, systemic, and translational framework. *International Journal of Recent Development in Engineering and Technology*, 15(3).
- [16] Aneeshkumar A.S. & C JothiVenkateswaran (2012), Estimating the surveillance of liver disorder using classification algorithms, *International Journal of Computer Applications*, 57(6), pp. 39-42.
- [17] Selvi, K., Anbarasan, P., Madhumita, G., Janaki, L., & Devi, K. K. (2026). Governance, security, and ethical considerations in AI-driven motion control systems. In *Methodologies and applications of intelligent motion control systems* (pp. 217–242). IGI Global.
- [18] Subramani, M., Chillagattu, V., Gayathri, K., Rastogi, V., & Ranganathan, S. (2026). Digital twin integration for predictive and real-time motion control in infrastructure engineering. In *Methodologies and applications of intelligent motion control systems* (pp. 189–216). IGI Global.
- [19] Swadhi, R., Gayathri, K., Suresh, N. V., Catherine, S., & Velmurugan, P. R. (2025). Leveraging machine learning for enhanced patient engagement and outcomes: Revolutionizing healthcare marketing. In *Impact of digital transformation on business growth and performance* (pp. 313–340). IGI Global.
- [20] Vetriselvan, R., Ramya, R., Selvalakshmi, V., Jyothi, P., & Velmurugan, P. R. (2026). Empowering patients through knowledge: Educational strategies in rehabilitation. In *Holistic approaches to health recovery* (pp. 263–290). IGI Global.
- [21] Vetriselvan, R., Velmurugan, P. R., Varshney, K. R., EP, J., & Deepika, R. (2025). Health impacts of smartphone and internet addictions across age groups: Physical and mental health across generations. In *Impacts of digital technologies across generations* (pp. 187–210). IGI Global.
- [22] Vijayalakshmi, M., Subramani, A. K., Vetriselvan, R., Velmurugan, P. R., & Hasine, J. (2025). Strategic collaborations in medical innovation and AI-driven globalization: Advancing healthcare startups. In *Navigating strategic partnerships for sustainable startup growth* (pp. 85–110). IGI Global.
- [23] Vinodh, N., Subramani, A. K., & Vetriselvan, R. (2026). Transforming the future of management and medical education: AI-driven innovations in curriculum design. In *AI education strategies for future-proofing curriculum design* (pp. 459–476). IGI Global.
- [24] Yatish, Khatoon, N., & Kumar, A. (2026). Advancing preventive strategies for chronic disease management: Clinical, behavioral, and population-level perspectives. *International Journal of Novel Trends and Innovation*, 4(2).