Spinghar University- Kabul

Spinghar Journal of Biomedical Sciences (SJBS)

Vol. 2, No. 1, Apr 2026, pp. 40-52

Knowledge and Clinical Preparedness of Dental Interns in Managing Hemophilic Patients During Tooth Extraction

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ARTICLE INFO

Type: Original Article
Received: 29/01/2026
Accepted: 20/04/2026

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DOI:
https://doi.org/10.64444/sjbs.36

ABSTRACT

Background: Hemophilia is an inherited bleeding disorder that poses significant clinical challenges in dental practice, especially during invasive procedures such as tooth extraction. In Afghanistan, where the infrastructure for specialized hemophilia care is limited, understanding the preparedness of dental professionals for patient safety is critical.

Methods: This descriptive cross-sectional study was conducted at the Faculty of Dentistry, Herat University, Afghanistan, between June and August 2024. The study assessed hemophilia awareness, dental management knowledge, clinical experience, perceived barriers, and educational needs among 53 dental interns using a census method.

Results: The majority of participants (69.8%) correctly identified hemophilia as a bleeding disorder. The mean correct response rate on general knowledge of hemophilia was 49.8%. Knowledge on dental management, specifically pre-extraction counseling (84.9%) and post-extraction bleeding control (73.6%), showed a mean accuracy rate of just over 58%. In coagulation testing, 20.8% correctly selected the activated partial thromboplastin time (APTT). Only 3.8% (n=2) of the 53 interns reported having previous clinical experience in managing hemophiliac patients, while 42.5% expressed little confidence in performing tooth extractions. The most commonly reported barriers were uncontrolled bleeding and lack of adequate equipment, and 56.6% reported facing multiple challenges simultaneously.

Conclusion: Dental interns demonstrated a moderate level of theoretical knowledge, but limited clinical experience and confidence in managing patients with hemophilia. These findings highlight the urgent need to strengthen undergraduate curricula, expand supervised clinical training, and promote interprofessional collaboration. Implementation of comprehensive educational interventions, including curriculum integration, workshops, and supervised clinical internships, can improve safe dental care in resource-limited settings and reduce preventable bleeding complications.

Keywords: Hemophilia; Dental management; Tooth extraction; Dental interns; Knowledge; Clinical preparedness

Introduction

Hemophilia is a rare, X-linked recessive, inherited bleeding disorder caused by a deficiency of specific clotting factors, Factor VIII (Hemophilia A) or Factor IX (Hemophilia B), essential for normal blood coagulation [1,2]. This deficiency leads to prolonged bleeding time and the potential for severe hemorrhage, particularly following trauma or surgical procedures. Hemophilia A is the most common form, accounting for approximately 80–85% of all cases, with an estimated incidence of 1 in 5,000 male births globally [3,4].

The severity of the disease is classified based on the circulating factor level, ranging from severe (<1% factor activity) to mild (>5% factor activity) [5]. Advances in factor replacement therapy, including the development of extended half-life products and non-factor replacement agents, have significantly improved the management of hemophilia in high-income countries; however, access to these therapies remains highly unequal across different regions and healthcare systems, particularly in low- and middle-income nations [6]. A recent meta-analysis using national registry data estimated the global prevalence of hemophilia at 17.1 per 100,000 males for hemophilia A and 3.8 per 100,000 males for hemophilia B, with approximately 1,125,000 men estimated to be living with hemophilia worldwide [7].

Children and young adults with congenital bleeding disorders experience poorer oral health-related quality of life compared to their healthy peers, reporting higher levels of dental anxiety, greater caries experience, and a more pronounced perceived need for dental treatment [8]. The dental management of patients with hemophilia (PWH) is a critical aspect of their overall care, as oral health procedures, especially tooth extractions, carry a significant risk of life-threatening bleeding complications [9]. Inadequate knowledge or delayed referral may lead to uncontrolled hemorrhage, prolonged hospitalization, or potentially fatal outcomes, particularly in settings where access to hemostatic agents and coagulation testing is limited. Therefore, dental practitioners must possess a comprehensive understanding of the disease pathophysiology, pre-operative assessment protocols, and evidence-based hemostatic management strategies. International guidelines strongly recommend a multidisciplinary approach, involving close consultation with the patient's hematologist or a specialized hemophilia treatment center (HTC) before any invasive procedure [10].

Key management strategies for dental extractions in PWH include the use of factor replacement therapy to raise factor levels to a safe threshold, the administration of antifibrinolytic agents such as tranexamic acid, and the application of local hemostatic measures [11,12]. A retrospective review of 247 adult patients who underwent 531 dental procedures across three Italian hemophilia centers with appropriate factor replacement reported a low bleeding complication rate of only 1.9%, demonstrating that dental treatment can be performed safely when evidence-based protocols are followed. The efficacy of tranexamic acid in reducing post-extraction hemorrhage has been well-established since the early 1970s, with early randomized controlled trials confirming its role as a cornerstone adjunctive therapy in hemophilia dental management [13]. Local anesthesia techniques must be carefully selected; while infiltration and intraligamentary injections are generally considered safe, regional nerve blocks are contraindicated without prior factor coverage due to the high risk of deep tissue hematoma formation [10]. Many dental students are not fully confident in selecting the appropriate anesthesia technique for PWH, underscoring the need for enhanced training in this domain.

Despite the existence of clear international guidelines, studies consistently show a signifi-

cant gap in the knowledge and confidence of dental students and practitioners worldwide regarding the safe management of PWH. In India, while 87% of dental professionals were aware of bleeding disorders, many still struggled with management, less than 60% ordered all the recommended blood tests, and nearly half of those who encountered bleeding complications had to hospitalize their patients rather than manage them clinically [15]. Similarly, in Singapore, researchers identified a lack of clinical exposure as the primary barrier to competence in managing medically compromised patients, noting that theoretical knowledge alone was insufficient to build clinical confidence [16]. This deficiency is often more pronounced in developing countries where access to specialized training and resources may be limited [17]. According to the World Federation of Hemophilia, only approximately 15% of people with hemophilia worldwide have access to adequate treatment, with the vast majority living in regions where diagnostic facilities and clotting factor concentrates are either unavailable or unaffordable [18].

Afghanistan, as a resource-limited country with a developing healthcare infrastructure, faces particular challenges in hemophilia care, including limited access to factor replacement therapy, hemophilia treatment centers, and structured training programs for healthcare providers. To the authors' knowledge, no epidemiological registry data on hemophilia prevalence in Afghanistan are currently available in the published literature, which further underscores the need for baseline assessments of healthcare provider preparedness in this context. Given that dental extractions are among the most common surgical procedures performed, assessing the preparedness of future dental professionals is paramount to improving patient safety and reducing morbidity.

We aimed to assess the knowledge and clinical preparedness of dental interns at Herat University regarding the management of hemophilic patients during tooth extraction, including associated risks, complications, and appropriate preventive measures. Additionally, we sought to identify specific educational needs and perceived barriers to effective hemophilia management among these dental interns. The findings of this study might help inform targeted educational interventions and improve patient safety in a resource-limited setting.

Materials and Methods

Study Design and Participants

This descriptive cross-sectional study included 53 dental interns at the Herat University Faculty of Dentistry, Herat, Afghanistan, during the 2024 academic year. Due to the small total population of eligible interns, a census method was employed, in which all dental interns enrolled during the study period were invited to participate. Inclusion criteria comprised all dental interns in their final year of training who were present during the data collection period and willing to participate. Interns who were absent on the day of data collection or who declined to provide informed consent were excluded. No incomplete questionnaires were received, as all distributed forms were completed in full under supervision.

Data Collection

A structured, self-administered questionnaire was distributed to all participants. The questionnaire comprised three main sections: (1) demographic characteristics; (2) true/false questions regarding the causes, types, and symptoms of hemophilia; and (3) questions related to skills and management of hemophilic patients before tooth extraction, presented as hypothetical clinical scenarios. The questionnaire was adapted from a standardized questionnaire format on dental management of hemophilic compromised patients [19]. The adaptation process included translation into the local language (Dari), content modification to reflect the local

clinical context, and review by two faculty members from the Department of Oral Surgery and one faculty member from the Department of Oral Medicine to assess face and content validity. The adapted questionnaire was pilot-tested with five dental interns (not included in the final sample) to assess clarity and comprehension, leading to minor wording adjustments. No formal reliability assessment (e.g., test-retest) was conducted due to logistical constraints, acknowledged as a limitation of this study.

Data Analysis

The questionnaire was administered in paper format during scheduled sessions in a supervised setting to minimize response bias. All responses were anonymous, and participants were informed that their responses would be used solely for research purposes and would not affect their academic evaluation. Responses were analyzed using SPSS version 27 (IBM Corp., Armonk, NY, USA), with descriptive statistics (frequencies, percentages, means) and cross-tabulations performed to summarize the findings. Given the exploratory and descriptive nature of the study, the small sample size, and the absence of hypotheses requiring statistical testing, the analysis was intentionally limited to descriptive methods. No inferential statistical analyses (e.g., chi-square tests, correlation analyses) were conducted, acknowledged as a limitation.

Ethical Considerations

Ethical approval for this study was obtained from the Institutional Review Board (IRB) of Herat University and Research Committee of Stomatology Faculty. All participants provided written informed consent prior to completing the questionnaire. Participation was entirely voluntary, and participants were informed of their right to withdraw at any time without consequence.

Results

Overall Awareness About Hemophilia

Participants' general knowledge regarding hemophilia was assessed using a series of core questions. Among the 53 respondents, 69.8% (n = 37) correctly identified hemophilia as a disorder of blood coagulation. The remaining responses included platelet deficiency disorder (15.1%, n = 8), blood infection (7.5%, n = 4), and uncertainty (7.5%, n = 4) (Table 1).

Regarding the most common type of hemophilia, 58.5% (n = 31) correctly identified Hemophilia A. The remaining participants selected Hemophilia B (22.6%, n = 12), Hemophilia C (1.9%, n = 1), or reported uncertainty (17.0%, n = 9) (Table 1).

Regarding the etiology of hemophilia, 50.9% of respondents (n = 27) correctly identified Factor VIII deficiency as the cause of Hemophilia A, while 13.2% (n = 7) each selected Factor VII deficiency or Factor IX deficiency, and 22.6% (n = 12) indicated uncertainty. For Hemophilia B, 18.9% of participants (n = 10) correctly identified Factor IX deficiency; the remaining respondents selected Factor VII (20.8%, n = 11), Factor VIII (26.4%, n = 14), or reported uncertainty (34.0%, n = 18) (Table 1).

The mean proportion of correct responses across all hemophilia-related knowledge questions was approximately 49.8% (Table 1).

Table 1: Overall Awareness About Hemophilia Among Dental Interns

Question	*Option*	*% Responded*	*Correct Answer*
What is hemophilia?	Disorder of blood coagulation	69.81	☑
	Platelet deficiency disease	15.09	✗
	Blood infection	7.55	✗
	Don't know	7.55	✗
Most common type of hemophilia	Hemophilia B	22.64	✗
	Hemophilia A	58.5	☑
	Hemophilia C	1.9	✗
	Don't know	17	✗
Hemophilia A is caused by deficiency of which coagulation factor?	Factor VIII	50.94	☑
	Factor VII	13.2	✗
	Factor IX	13.21	✗
	Don't know	22.64	✗
Hemophilia B is caused by deficiency of which coagulation factor?	Factor VII	20.75	✗
	Factor VIII	26.24	✗
	Factor IX	18.9	☑
	Don't know	33.96	✗

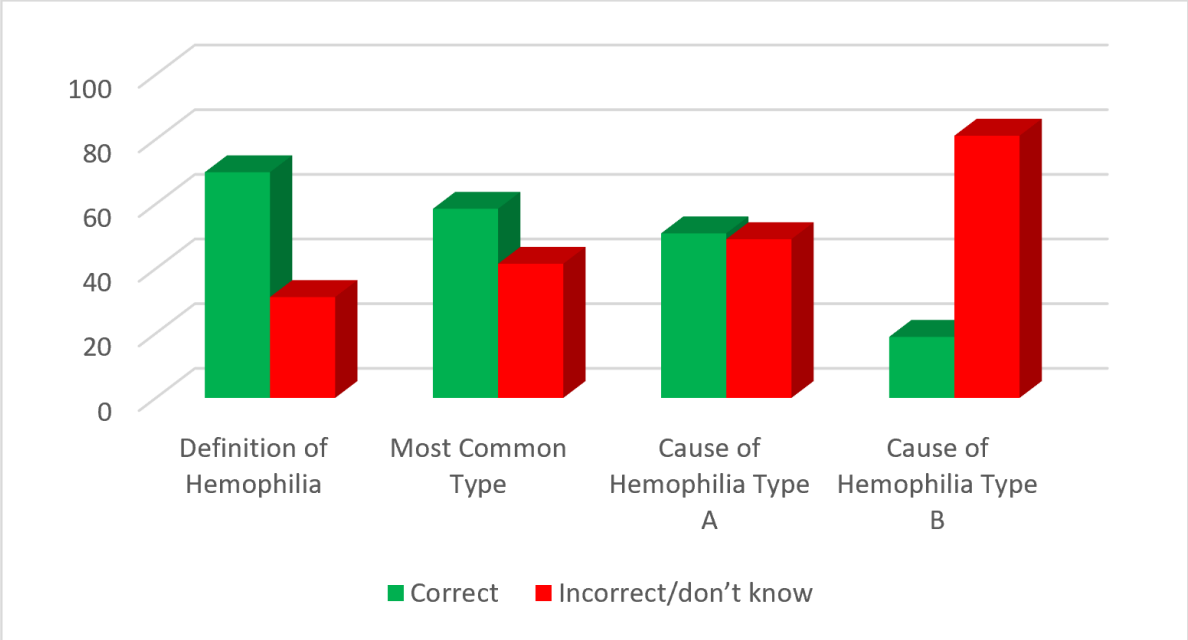

Figure 1: Overall Awareness About Hemophilia

Knowledge Regarding Dental Management of Hemophilic Patients

Participants' knowledge of dental management principles for hemophilic patients was evaluated across several domains. Regarding bleeding risk during tooth extraction, 81.1% of respondents (n = 43) correctly identified bleeding, and 84.9% (n = 45) acknowledged the necessity of pre-extraction consultation with a hematologist (Table 2).

For post-extraction bleeding control, 73.6% of participants (n = 39) correctly identified hemostatic agents as the most appropriate method. For coagulation assessment, 20.8% (n = 11) correctly selected activated partial thromboplastin time (APTT) as the appropriate laboratory test.

Regarding pharmacological and procedural management, 58.5% (n = 31) correctly identified tranexamic acid for reducing bleeding, 52.8% (n = 28) selected infiltration anesthesia as the safest technique, and 56.6% (n = 30) selected paracetamol as the safest analgesic.

The average proportion of correct responses across dental management questions was approximately 58% (Table 2, Figure 2).

Table 2: Knowledge Regarding Dental Management of Hemophilic Patients Among Dental Interns

Question	*Option*	*% Responded*	*Correct Answer*
What is the most important risk during tooth extraction in hemophilic patients?	Bleeding	81.13	☑
	Infection	7.5	✗
	Severe pain	5.7	✗
	Don't know	5.7	✗
Before tooth extraction, which action is essential for hemophilic patients?	Consultation with hematologist	84.9	☑
	Radiography	9.4	✗
	Antibiotic prescription	1.9	✗
	None	3.8	✗
To control bleeding after tooth extraction in hemophilic patients, which method is better?	Hemostatic agents	73.6	☑
	Antibiotic prescription	7.5	✗
	Regular sterile gauze	7.5	✗
	Don't know	11.3	✗
Which test is suitable to evaluate coagulation status in hemophilic patients before extraction?	CBC	32.1	✗
	APTT	20.8	☑
	PT	22.6	✗
	Don't know	24.5	✗
	Aspirin	11.3	✗
	Ibuprofen	3.8	✗
	Tranexamic acid	58.5	☑
	Don't know	26.4	✗
Which anesthesia method is safer for hemophilic patients?	Infiltration	52.8	☑
	General anesthesia	3.8	✗
	Nerve block	30.2	✗
	Don't know	13.2	✗
	Ibuprofen	15.1	✗
	Paracetamol	56.6	☑
	Naproxen	9.4	✗
	Aspirin	18.9	✗

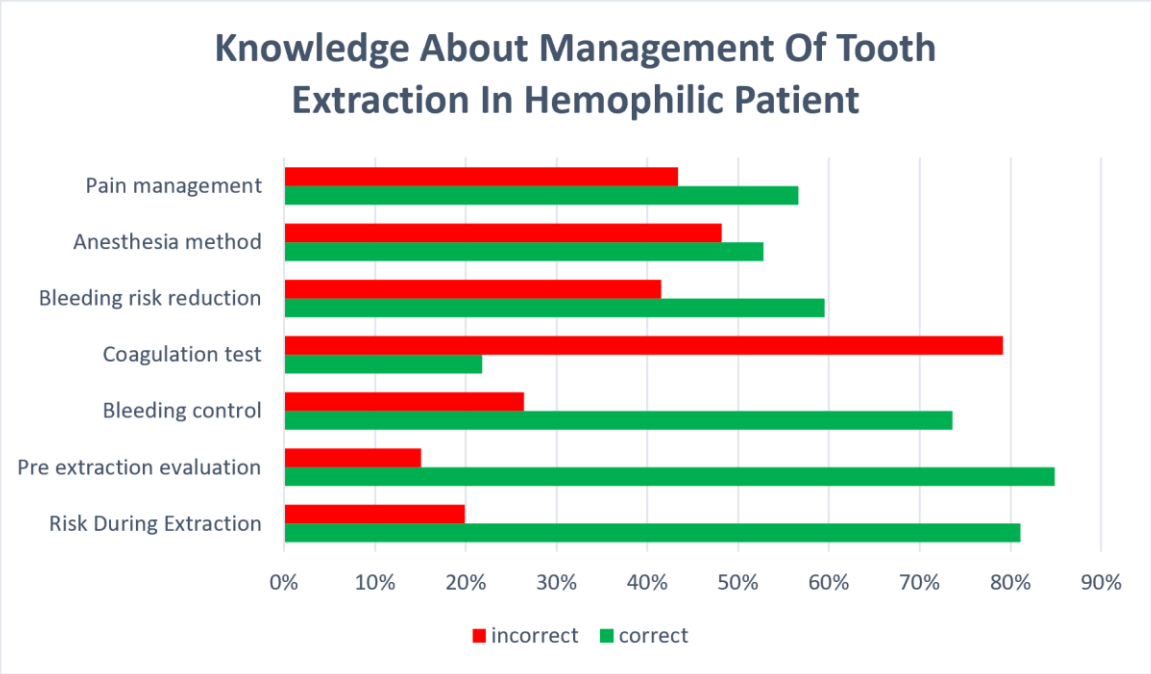

Figure 2: Knowledge Regarding Dental Management of Hemophilic Patients

Clinical Experience and Self-Reported Confidence

Among the 53 interns, 3.8% (n = 2) reported prior experience in performing tooth extraction for patients diagnosed with hemophilia, and 96.2% (n = 51) reported no such experience (Table 3).

Self-reported confidence in managing hemophilic patients during tooth extraction was categorized as high by 13.2% (n = 7), moderate by 45.3% (n = 24), and low by 42.5% (n = 22) of participants (Table 3).

Table 3: Clinical Experience and Self-Reported Confidence in Managing Hemophilic Patients Among Dental Interns

Variable	*Category*	*n (%)*
Prior clinical experience in managing hemophilic patients	Yes	2 (3.8)
	No	51 (96.2)
Self-reported confidence in managing hemophilic patients	High	7 (13.2)
	Moderate	24 (45.3)
	Low	22 (42.5)

Perceived Barriers to Tooth Extraction in Hemophilic Patients

Participants' perceived barriers to tooth extraction in hemophilic patients are presented in Table 4. The most frequently cited individual barrier was uncontrolled bleeding (24.5%, n = 13), followed by lack of adequate equipment (15.1%, n = 8) and insufficient dentist aware-

ness of the patient's condition (3.8%, n = 2). More than half of the participants (56.6%, n = 30) selected all listed barriers.

Table 4: Preferred Clinical Approach, Educational Strategies, and Perceived Barriers Among Dental Interns

Variable	*Category*	*n (%)*
Perceived barriers to tooth extraction	Uncontrolled bleeding	13 (24.5)
	Lack of adequate equipment	8 (15.1)
	Insufficient dentist awareness	2 (3.8)
	All of the above	30 (56.6)
Preferred clinical approach	Refer to hematologist first	24 (45.3)
	Initiate treatment immediately	6 (11.3)
	Extraction without referral	6 (11.3)
	Avoid treatment altogether	17 (32.1)
Preferred educational strategy	Comprehensive approach	37 (69.8)
	Educational workshops	6 (11.3)
	Curriculum integration	7 (13.2)
	Supervised practical training	3 (5.7)

Preferred Clinical Approach and Educational Strategies

Participants preferred clinical approaches are presented in Table 4. Regarding clinical approach, 45.3% (n = 24) would refer to a hematologist and assess coagulation status prior to treatment, 11.3% (n = 6) would initiate treatment immediately, 11.3% (n = 6) would proceed with extraction without referral, and 32.1% (n = 17) would avoid treatment altogether.

Regarding educational strategies, 69.8% (n = 37) selected a comprehensive approach encompassing all proposed strategies. The remaining participants preferred educational workshops (11.3%, n = 6), curriculum integration (13.2%, n = 7), or supervised practical training (5.7%, n = 3) (Table 4).

Discussion

The primary finding of this study is that dental interns at Herat University demonstrated moderate theoretical knowledge (49.8% for general hemophilia knowledge, 58% for dental management knowledge) but reported critically low levels of clinical experience (3.8%) and confidence (42.5% low) regarding the management of patients with hemophilia (PWH). While these findings are consistent with patterns reported in other settings, the extent to which they reflect broader systemic challenges in den-

tal education cannot be determined from this single-institution study.

The perceived barriers, particularly the risk of uncontrolled bleeding and lack of adequate equipment, may reflect the reality of managing a complex condition in a resource-limited setting. In Herat, access to hemophilia-specific resources such as factor replacement products, coagulation testing laboratories, antifibrinolytic agents, and specialized hemophilia treatment centers may be limited, which may increase the risk associated with invasive dental procedures. The strong preference among participants (69.8%) for a comprehensive educational approach, including workshops and supervised training, aligns with international recommendations from the World Federation of Hemophilia [3] and guidance from professional bodies, which advocate for structured, hands-on training to bridge the competence gap [10]. Studies from more developed settings have reported higher knowledge levels; for instance, George and colleagues in Malaysia reported a higher average knowledge score of 73.73%, suggesting that variations in curriculum structure and clinical exposure contribute to differences in theoretical competence [12].

One result that caught our attention was the low rate of correct APTT identification (20.8%). This points to a basic gap in diagnostic knowledge, the kind of thing that matters directly when planning surgery safely. On a more positive note, the high percentage of interns who recognized the need for hematologist consultation (84.9%) compares well with findings from other settings. Komo and Farhan, in a survey of dental students and dentists in Saudi Arabia, found that many respondents were not fully confident in their understanding of bleeding management after tooth extraction, and only about a third of interns and final-year students were familiar with hemostatic medications. The fact that interns at Herat University showed stronger awareness of the need for hematologist consultation suggests that the idea of a multidisciplinary approach to PWH care has taken hold here [14].

The near-total lack of clinical experience (3.8%) and the low confidence levels (42.5% reporting low confidence) are notable findings. These co-occurring patterns may suggest a relationship between clinical exposure and self-assessed confidence, although this association was not formally tested in the present study. The percentage of interns (32.1%) who would choose to avoid treatment altogether further highlights the potential impact of limited confidence on clinical decision-making, a finding that has been reported elsewhere in the literature [15]. This knowledge-practice gap is a recognized global issue. Sng and colleagues identified a lack of clinical exposure as the main barrier to competence in managing medically compromised patients [16]. In developing countries, the scarcity of factor concentrates and specialized centers places a greater burden on local healthcare providers [17].

The observed knowledge levels are comparable to findings from other regional studies, although direct comparisons should be interpreted cautiously given differences in participant populations, educational settings, questionnaire design, and scoring methods across studies. In India, only 53% of dental interns were aware of the correct management protocol, further supporting the moderate knowledge level observed in the present study [19]. In a cross-sectional study conducted in Egypt, a majority of the participants had either moderate (48.1%) or poor (36.7%) knowledge about bleeding, aligning closely with the results from Herat University [20].

The finding regarding the low identification rate of APTT is consistent with a study in Saudi Arabia, which also identified coagulation testing as a weak area among dental students [21]. Similarly, a US-based dissertation found that while students possessed theoretical knowledge, they expressed low confidence in providing care for PWH, suggesting that com-

petence may be linked to experiential learning [22].

The importance of local hemostatic measures as an adjunct or alternative to factor replacement has been increasingly recognized in the literature. An influential review demonstrated that dental extractions can be performed safely in anticoagulated patients using local hemostatic measures without altering anticoagulant therapy, suggesting that meticulous local hemostasis may serve as a viable strategy for managing PWH in resource-limited settings where factor concentrates are unavailable [23]. Emphasizing such non-factor-based approaches in dental curricula could equip practitioners in low-resource environments with practical, evidence-based strategies for managing bleeding complications during and after dental procedures.

Furthermore, the context of resource-limited healthcare systems warrants additional consideration. In a survey of general dentists conducted in Iran, Robati and colleagues found inadequate knowledge about bleeding disorders during dental procedures, with many practitioners expressing uncertainty about the appropriate pre-operative assessments and hemostatic protocols [24]. Ndoumba-Mintya and colleagues reviewed the current challenges facing hemophilia care in resource-limited countries and identified financial constraints, insufficient government commitment, and lack of trained healthcare personnel as major barriers to optimal care delivery [25]. These findings collectively reinforce the need for targeted educational interventions and the development of simplified, context-appropriate clinical guidelines for dental practitioners in low-resource settings.

Finally, the role of innovative educational modalities in addressing the identified knowledge and confidence gaps deserves consideration. A scoping review identified simulation-based training as a promising approach to enhance clinical skills development in dental education, with evidence suggesting that simulated clinical scenarios can effectively bridge the gap between theoretical knowledge and practical competence [26]. Integrating such approaches into undergraduate dental curricula, alongside structured clinical rotations in hematology settings, may help prepare future dental professionals to manage PWH more effectively, even in the absence of frequent direct clinical exposure.

In a resource-limited setting like Herat, the management of dental extractions in PWH is inherently more complex. The lack of readily available factor concentrates and limited referral pathways to hematology services mean that even minor invasive procedures carry a potentially elevated risk of complications. This context may partly explain the interns' low confidence levels. The findings suggest that educational interventions should not only focus on clinical knowledge but also on developing robust protocols for managing PWH within the constraints of the local healthcare system, emphasizing non-invasive treatments, meticulous local hemostasis, and strong referral pathways to available hematology services. However, self-reported confidence may not fully correspond to actual clinical competence, and questionnaire-based knowledge assessment may not capture procedural readiness or decision-making in real clinical settings. Additionally, the rarity of hemophilia cases in the general population may inherently limit clinical exposure opportunities, regardless of curriculum content.

Limitations

Several limitations should be considered when interpreting the findings of this study. First, the study was conducted at a single institution with a relatively small sample size (n = 53), which may limit the generalizability of findings to other dental schools or regions. The results should therefore be interpreted in the context of this specific setting and population. Second, the questionnaire used in this study was adapted from a Nordic format, but no formal reliability

assessment (e.g., test-retest reliability, internal consistency) was conducted, which limits the ability to assess the measurement properties of the instrument. While face and content validity were reviewed by faculty members, the absence of a formal validation process is a notable limitation. Third, the study relied on self-reported knowledge and confidence levels, which may be subject to recall bias, social desirability bias, or overestimation of competence. Self-reported confidence may not accurately reflect actual clinical performance or procedural readiness. Fourth, the analysis was limited to descriptive statistics; no inferential analyses were conducted to explore potential associations between knowledge, clinical experience, and confidence levels. The Discussion section has therefore framed possible relationships cautiously as observed co-occurring patterns rather than statistically tested associations. Fifth, the study did not assess participants' prior exposure to hemophilia-related content in the formal curriculum, which limits the ability to identify specific curricular gaps. Future studies incorporating multi-institutional designs, formal instrument validation, objective competency assessments, and inferential analyses would strengthen the evidence base.

Future Research Directions

Future research should consider multi-institutional studies across Afghanistan to assess whether the patterns observed at Herat University are representative of dental interns nationwide. Longitudinal studies tracking changes in knowledge and confidence following educational interventions would help evaluate the effectiveness of specific training programs. Additionally, qualitative studies exploring interns' experiences and perceptions in greater depth could provide valuable insights into the barriers to preparedness. Research assessing the availability and accessibility of hemophilia-related resources (e.g., factor concentrates, coagulation testing, hematology referral pathways) within the Afghan healthcare system would also help contextualize the challenges identified in this study.

Conclusion

Dental interns at Herat University demonstrated moderate theoretical knowledge (49.8% general hemophilia knowledge, 58% dental management knowledge), but limited clinical experience (3.8%) and confidence (42.5% reporting low confidence) in managing patients with hemophilia. Particularly concerning were the low rates of correct identification of the appropriate coagulation test (APTT, 20.8%) and the high proportion of interns who would avoid treatment altogether (32.1%). These findings highlight the critical need to strengthen undergraduate curricula with emphasis on diagnostic protocols and safe anesthesia techniques, expand supervised clinical training opportunities, and promote interprofessional collaboration between dental and medical professionals. Implementing comprehensive educational interventions, including integrating curriculum content, conducting educational workshops, and providing supervised practical training, may improve the safe and effective management of hemophilic patients in dentistry. However, given that these findings are based on a single-institution sample, they should be generalized cautiously to other settings. Multi-institutional studies are recommended to confirm and extend these observations.

Acknowledgments

This research received no external funding. We sincerely thank the dental students of Herat University Faculty of Stomatology for their voluntary participation in this study. Their cooperation was essential to the success of this research. We also extend our gratitude to the faculty and administrative staff of the Faculty

of Stomatology for their support during data collection. We also acknowledge the use of Qwen AI for sentence restructuring, translation, and editorial refinement of the manuscript.

Conflict of Interest

The authors declare no potential conflicts of interest with respect to the research, authorship, or publication of this article.

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