

Clinical Trial Protocol

Iranian Registry of Clinical Trials

12 Sep 2026

Effectiveness of Chatbot-facilitated Case based learning in Oral Pathology, a pilot randomized cross-over trial.

Protocol summary

Study aim

To compare knowledge outcomes following chatbot-facilitated case-based learning and traditional facilitator-led case-based learning among undergraduate dental students.

Design

A single-center concealed, randomized, crossover trial conducted among third-year Bachelor of Dental Surgery (BDS) students between December 2025 and January 2026. Because of the nature of the educational intervention, participants and facilitators were not blinded. A total of 32 students participated in Session 1 and 27 students participated in Session 2.

Settings and conduct

Foundation University College of Dentistry, Foundation University Islamabad.

Participants/Inclusion and exclusion criteria

Participants 3rd Year Bachelor of Dental Surgery (BDS) students. Inclusion Criteria ☐ Third-year BDS students. ☐ Enrolled in the Oral Pathology course. ☐ Able to understand English. ☐ Provided written informed consent. ☐ Willing to participate in both study sessions. Exclusion Criteria ☐ Declined participation. ☐ Withdrew consent. ☐ Absent during either study session or the corresponding assessments.

Intervention groups

Intervention Students participated in chatbot-facilitated case-based learning using a customized GPT-based educational chatbot. Participants were stratified based on their most recent Oral Pathology examination scores and randomized in a 1:1 ratio into two sequences: ☐ Sequence 1: Traditional CBL → Chatbot-CBL ☐ Sequence 2: Chatbot-CBL → Traditional CBL. The study followed a crossover design in which students participated in two CBL sessions conducted two weeks apart to minimize potential carryover effects (Session 1: Soft Tissue Pathology; Session 2: Salivary Gland Pathology). Control Group In both sequences, the traditional CBL served as control group.

Main outcome variables

Knowledge outcomes of traditional vs chat-bot CBL.

General information

Reason for update

Acronym

Chat-CBL TRIAL

IRCT registration information

IRCT registration number: **IRCT20260720070263N1**

Registration date: **2026-07-28, 1405/05/06**

Registration timing: **retrospective**

Last update: **2026-07-28, 1405/05/06**

Update count: **0**

Registration date

2026-07-28, 1405/05/06

Registrant information

Name

Amna Waheed

Name of organization / entity

Foundation University Islamabad

Country

Pakistan

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Recruitment status

Recruitment complete

Funding source

Expected recruitment start date

2025-12-20, 1404/09/29

Expected recruitment end date

2026-01-10, 1404/10/20

Actual recruitment start date

2025-12-26, 1404/10/05

Actual recruitment end date

2026-01-16, 1404/10/26

Trial completion date

2026-01-16, 1404/10/26

Scientific title

Effectiveness of Chatbot-facilitated Case based learning in Oral Pathology, a pilot randomized cross-over trial.

Public title

Using an AI chatbot to facilitate case-based learning for undergraduate dental students.

Purpose

Education/Guidance

Inclusion/Exclusion criteria**Inclusion criteria:**

Third-year BDS students. Enrolled in the Oral Pathology course. Able to understand English. Provided written informed consent and willing to participate in both study sessions.

Exclusion criteria:

Third year BDS students who declined participation, Or withdrew consent. Or absent during either study session or the corresponding assessments.

Age

From **20 years** old to **24 years** old

Gender

Both

Phase

N/A

Groups that have been masked

No information

Sample size

Target sample size: **32**

Actual sample size reached: **27**

Randomization (investigator's opinion)

Randomized

Randomization description

Randomization Participants were stratified according to previous Oral Pathology examination scores (high and low academic performance) and randomly allocated in a 1:1 ratio using computer-generated random numbers with permuted blocks of four. Allocation Concealment Group allocation was concealed using sequentially numbered opaque sealed envelopes prepared by an independent researcher. Blinding Because of the nature of the educational intervention, participants and facilitators were not blinded. Outcome assessment was performed using anonymized participant codes.

Blinding (investigator's opinion)

Not blinded

Blinding description**Placebo**

Not used

Assignment

Crossover

Other design features

Retrospective trial registration.

Secondary Ids

empty

Ethics committees**1****Ethics committee****Name of ethics committee**

Foundation University School of Health Sciences
Ethical Review Board.

Street address

DHA 1, Islamabad.

City

Islamabad.

Postal code

45000

Approval date

2025-12-19, 1404/09/28

Ethics committee reference number

FF/FUMC/215-723 Phy/25

Health conditions studied**1****Description of health condition studied**

Not applicable as outcomes are educational.

ICD-10 code**ICD-10 code description****Primary outcomes****1****Description**

The primary outcome was the knowledge scores between both groups of students i.e. traditional case-based learning group and chat-bot facilitated case-based learning group. It was assessed using a 10-item multiple-choice question (MCQ) test administered before and after each case-based learning (CBL) session for both traditional and chatbot group. The MCQ assessment was developed specifically for this study based on the undergraduate Oral Pathology curriculum and reviewed for content validity by two subject experts.

Timepoint

Knowledge was assessed using pre-test multiple-choice questions (MCQs) i.e. before the intervention; traditional & chat-bot facilitated case-based learning (CBL) and after each intervention. Two weeks after the cross-over of groups in session 2 again pre and post-session knowledge assessed using MCQ as an instrument.

Method of measurement

For both sessions MCQ based assessment was used which measured the knowledge scores obtained by students.

Secondary outcomes

empty

Intervention groups

1

Description

Intervention group 1: Participants were stratified based on their most recent Oral Pathology examination scores and randomized in a 1:1 ratio into two sequences: Sequence 1: Traditional CBL → Chatbot-CBL Description of Intervention :Phase 1 (Session 1 - Soft Tissue Pathology): Participants receive Traditional Case-Based Learning (CBL) guided by trained faculty facilitators using specific case materials, structures, and prompts. Washout Period: A two-week interval to minimize carryover effects. Phase 2 (Session 2 - Salivary Gland Pathology): Participants switch to Chatbot-CBL. Each group interacts with the chatbot using a shared device. The chatbot delivers case content stepwise (history, clinical findings, imaging, histopathology) and provides immediate feedback. Traditional CBL serves as control in sequence 1.

Category

Behavior

2

Description

Intervention group 2: Sequence 2 (Chatbot-CBL → Traditional CBL) Description of Intervention: Phase 1 (Session 1 - Soft Tissue Pathology): Participants receive Chatbot-CBL. Each group interacts with the chatbot using a shared device. The chatbot delivers case content stepwise (history, clinical findings, imaging, histopathology) and provides immediate feedback. Washout Period: A two-week interval to minimize carryover effects .Phase 2 (Session 2 - Salivary Gland Pathology): Participants switch to Traditional CBL guided by trained faculty facilitators using identical case materials, structures, and prompts. Traditional CBL serves as control in this sequence 2.

Category

Behavior

Recruitment centers

1

Recruitment center

Name of recruitment center

Foundation University Islamabad.

Full name of responsible person

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Sponsors / Funding sources

1

Sponsor

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Full name of responsible person

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Grant name

Not applicable

Grant code / Reference number

Is the source of funding the same sponsor organization/entity?

Yes

Title of funding source

Foundation University Islamabad.

Proportion provided by this source

1

Public or private sector

Private

Domestic or foreign origin

Domestic

Category of foreign source of funding

empty

Country of origin

Type of organization providing the funding

Academic

Person responsible for general inquiries

Contact

Name of organization / entity

Foundation University Islamabad.

Full name of responsible person

Amna Waheed

Position

Demonstrator

Latest degree

Medical doctor

Other areas of specialty/work

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Sharing plan

Deidentified Individual Participant Data Set (IPD)

Yes - There is a plan to make this available

Study Protocol

Yes - There is a plan to make this available

Statistical Analysis Plan

Undecided - It is not yet known if there will be a plan to make this available

Informed Consent Form

Yes - There is a plan to make this available

Clinical Study Report

Not applicable

Analytic Code

Not applicable

Data Dictionary

Not applicable

Title and more details about the data/document

Data sharing statement mentioned at the end of manuscript i.e. available only on request.

When the data will become available and for how long

After publication of manuscript till 6 months.

To whom data/document is available

anyone working in academic institution.

Under which criteria data/document could be used

Corresponding author can be contacted after article is published.

From where data/document is obtainable

Contacting corresponding author.

What processes are involved for a request to access data/document

Anyone needing to replicate this study will contact the corresponding author via email.

Comments