ALEXANDRIA UNIVERSITY

Faculty of Medicine

RESEARCH PROTOCOL

Helmet Use and Head-Injury History Among Motorcycle Delivery Riders in Alexandria, Egypt

A Cross-Sectional Study

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Structured summary

Background: Motorcycle delivery work has expanded rapidly in Egypt, and delivery riders spend long hours in mixed urban traffic. Helmets substantially reduce the risk of head injury and death in motorcycle crashes, yet no published study has directly observed helmet use among delivery riders in Alexandria. The only Egyptian study of delivery riders relied on self-report and did not focus on helmets or head injury.

Objectives: To estimate the observed prevalence of correct helmet use among motorcycle delivery riders in Alexandria; to compare observed and self-reported helmet use; to estimate the 12-month prevalence of crashes and crash-related head injury; and to identify factors associated with helmet non-use and head injury.

Methods: A two-part cross-sectional study. Part A is a structured roadside observation of at least 1,068 delivery riders at six intersections across Alexandria. Part B is a face-to-face interview with 428 delivery riders recruited consecutively at delivery pickup points. Data collection will be completed within 3 months. Data will be analysed in jamovi using descriptive statistics, McNemar's test and multivariable logistic regression.

Expected outcomes: The first observation-based estimate of helmet use among delivery riders in Alexandria, a measure of over-reporting of helmet use, and evidence to guide employer, platform and public-health interventions to prevent traumatic brain injury.

1. Background and rationale

1.1 Road traffic injury and motorcyclists

Road traffic injuries are a leading cause of death and disability worldwide, and motorcyclists are among the most vulnerable road users[1]. Egypt has historically reported one of the highest road traffic death rates in its region, estimated at 42 deaths per 100,000 population[2]. Head injury is the main cause of death and severe disability after motorcycle crashes, and Egyptian hospital series confirm the burden of neurotrauma among motorcyclists[3,4].

1.2 Helmets as a proven intervention

A Cochrane systematic review found that motorcycle helmets reduce the risk of head injury by around 69% and the risk of death by around 42%[5]. A later meta-analysis of 100 studies estimated that helmets reduce the risk of head and face injury by 57% and the risk of death by 45%, while pooled helmet-use rates were only 63% among riders and 41% among passengers[6]. The protective effect depends on correct use: the helmet must be of a standard type and firmly fastened[7,8].

1.3 Delivery riders: a growing, high-risk occupational group

Online food and goods delivery has grown rapidly in Egypt, much of it carried out by motorcycle riders who work under time pressure, often in informal or platform-based arrangements[9]. In Mansoura, 57.0% of 172 interviewed delivery drivers reported at least one work-related road accident; university education, more than five years of driving experience and mobile phone use while driving were independent predictors[10]. Studies outside Egypt have shown that delivery riders frequently engage in

risky riding behaviours and that helmet use is protective against injury in this group[11], although helmet use varies widely by setting and employer[12].

1.4 Why observation matters

Most studies of helmet use among riders rely on self-report. In Hyderabad, India, 64.7% of interviewed motorcyclists reported always wearing a helmet, 2.2 times the 29.4% observed in the same group[13]. Self-reported estimates are therefore likely to overstate protection. Roadside observation is the recommended method for measuring helmet-wearing rates[7] and has already been used successfully in Alexandria to measure seatbelt use[2].

1.5 Knowledge gap

To the investigators' knowledge, no published study has (a) directly observed helmet use among motorcycle delivery riders in Alexandria, (b) compared observed with self-reported helmet use in this group in Egypt, or (c) examined crash-related head injury specifically among Egyptian delivery riders. The Mansoura study relied on self-report, focused on accidents in general, and found mostly lower-limb injuries[10]. Earlier Egyptian studies were hospital-based and included only injured riders[14]. This study addresses these gaps.

2. Research question and objectives

2.1 Research question

How often do motorcycle delivery riders in Alexandria actually wear a helmet correctly, how often do they experience crashes and head injuries, and which factors are associated with helmet non-use and head injury?

2.2 Primary objective

To estimate the observed prevalence of correct helmet use (a standard helmet, worn and fastened) among motorcycle delivery riders in Alexandria, Egypt.

2.3 Secondary objectives

1. To describe helmet type and other observed risk behaviours (handheld phone use, carrying a passenger) by site and time of day.
2. To compare self-reported helmet use with observed helmet use among interviewed riders.
3. To estimate the 12-month prevalence of road crashes and crash-related head injury among interviewed riders.
4. To identify sociodemographic, occupational and behavioural factors associated with (a) helmet non-use and (b) crash-related head injury.

2.4 Hypotheses

- H1: Self-reported helmet use will be significantly higher than observed helmet use.
- H2: Longer working hours, younger age and perceived time pressure from the employer or app will be associated with helmet non-use.
- H3: Helmet non-use will be associated with higher odds of crash-related head injury.

3. Methods

3.1 Study design

A descriptive and analytical cross-sectional study with two concurrent components: (A) structured roadside observation and (B) face-to-face interviews. Reporting will follow the STROBE statement[15].

3.2 Study setting and period

Alexandria, Egypt's second-largest city. Data collection will start after ethics approval and the pilot phase, is planned to take 6 to 8 weeks, and will be completed within a maximum of 3 months. Six observation sites will be purposively selected to represent different road types and districts: two main arterial roads (for example, the Corniche and a central arterial road), two dense commercial areas and two residential areas. Interview sites will be delivery pickup points (restaurant clusters, shopping malls and app rider hubs) in the same districts.

3.3 Study population

Target population: motorcycle (including scooter) riders working in delivery in Alexandria.

Operational identification of a delivery rider: a rider carrying a delivery box or insulated bag, or wearing a delivery company or app uniform.

Part A eligibility: every identifiable delivery rider passing the observation point during a session. Riders whose head cannot be clearly seen are recorded as "unable to assess" and excluded from the denominator.

Part B inclusion criteria: delivery rider aged 18 years or older, working in Alexandria for at least one month, and able to give verbal informed consent in Arabic.

Part B exclusion criteria: refusal, inability to communicate in Arabic, or having already been interviewed in this study.

3.4 Part A: roadside observation

Sessions: each site will be observed in 1-hour sessions covering three time bands: midday peak (12:00 to 15:00), evening peak (18:00 to 21:00) and late evening (21:00 to 24:00), on both weekdays and weekends. Each site will receive at least six sessions.

Observers: two trained observers per session, positioned on the pavement at a safe distance from traffic with a clear view of riders slowing or stopping at the intersection.

Recording: a standardised paper or mobile checklist (Appendix A) will record for each delivery rider: helmet worn (yes/no); helmet fastened (yes/no/cannot tell); helmet type (full-face, open-face, half or non-standard); handheld phone use while moving (yes/no); passenger present (yes/no); passenger helmet (yes/no); apparent age group; vehicle type; site, date and time band. No names, faces or licence plates will be recorded.

Inter-observer agreement: in about 10% of sessions both observers will independently record the same riders; agreement on helmet use and fastening will be assessed with Cohen's kappa[16], with a target of kappa ≥ 0.80.

3.5 Part B: interviews

Recruitment: trained interviewers will approach consecutive delivery riders waiting at pickup points. Interviews will take place only while riders are stationary and will be kept to 5 to 7 minutes so as not to delay deliveries.

Instrument: a structured, interviewer-administered questionnaire (Appendix B) developed from previous studies of motorcyclist and delivery-rider safety[8,10,13]. It has six sections: sociodemographic data; work characteristics; helmet ownership, use and reasons for non-use; risky riding behaviours; crashes in the past 12 months; and crash-related head injury. As an internal validity check, the interviewer will also record whether the rider arrived wearing a helmet.

Language of administration: the questionnaire is written in English and administered face to face. The interviewer (the principal investigator or a trained co-investigator) asks each question orally in Arabic and records the rider's answer directly on the English form, which uses closed-ended response options. A formal forward and backward translation is not planned, because the form consists of short factual questions rather than a validated psychometric scale. To keep the oral Arabic wording consistent between interviewers, the team will agree on how each question is asked during training and practise it in the pilot (Section 3.8).

Content validity: before the pilot, the questionnaire will be reviewed for relevance and clarity by the supervisor.

3.6 Operational definitions

Term	Definition used in this study
Delivery rider	Motorcycle or scooter rider carrying a delivery box or bag, or wearing a delivery company or app uniform
Any helmet use	Any head covering resembling a helmet worn on the head while riding
Correct helmet use (primary outcome)	A standard motorcycle helmet (full-face or open-face) worn on the head with the chin strap fastened
Self-reported helmet use	Rider answers "always" to "How often do you wear a helmet while delivering?"
Crash	Self-reported collision or fall while riding in the past 12 months
Crash-related head injury	Self-reported blow to the head during a crash in the past 12 months followed by at least one of: loss of consciousness, memory loss for the event, confusion, repeated vomiting, or a hospital visit for the head injury

3.7 Sample size

Sample sizes were calculated with the single-proportion formula $n = Z^2 \times p \times (1 - p) / d^2$[17], at 95% confidence ($Z = 1.96$).

Part A (observation): no prior estimate of helmet use among delivery riders in Alexandria exists, so the most conservative value $p = 0.50$ was used with an absolute precision of ±3% ($d = 0.03$): $n = 1.96^2 \times 0.50 \times 0.50 / 0.03^2 = 1{,}067.1$, rounded up to **1,068 observed riders**. Because observation is

inexpensive, collection will continue until each site and time band contributes, and the final number is expected to exceed this minimum.

Part B (interviews): no Egyptian estimate of 12-month crash prevalence among delivery riders is available (the only Egyptian study reported accidents over the whole delivery career[10]), so the most conservative value p = 0.50 was used with an absolute precision of ±5% (d = 0.05): $n = 1.96^2 \times 0.50 \times 0.50 / 0.05^2 = 384.2$, rounded up to 385. Allowing 10% non-response or incomplete data (385 / 0.90 = 427.8), the target is **428 interviewed riders**, distributed roughly equally across the six districts (about 71 per district). Because p = 0.50 gives the largest sample, this size is sufficient to estimate any Part B proportion (self-reported helmet use, crash prevalence or head-injury prevalence) with a precision of ±5% or better.

Recall period: crashes and head injuries will be asked about over the past 12 months. A shorter window (for example, 3 months) would reduce recall bias, but crash-related head injuries would then be too few to analyse their associated factors. The 12-month window is the one commonly used in surveys of delivery riders, and the resulting recall bias is addressed in Section 6.

3.8 Training and pilot study

All data collectors will receive a half-day training session covering identification of delivery riders, helmet classification with photographs, use of the checklist, the agreed oral Arabic wording of each interview question, the Arabic consent script, consent procedures and field safety. A pilot will include two observation sessions and about 20 interviews (about 5% of the target). Pilot data will be used to check that riders understand the questions as asked in Arabic, refine the tools, and estimate interview duration and refusal rate, and will not be included in the final analysis.

3.9 Variables

Type	Variables
Primary outcome	Observed correct helmet use (Part A)
Secondary outcomes	Self-reported helmet use; crash in past 12 months; crash-related head injury (Part B)
Sociodemographic	Age, sex, marital status, education, nationality, residence district
Occupational	Employer type (app/platform, restaurant, company, freelance); years in delivery; hours per day; days per week; payment per order or fixed salary; penalties for late delivery; ownership of motorcycle; employer provides helmet
Behavioural	Helmet ownership; reasons for non-use; phone use while riding; speeding; red-light running; riding licence
Observation context	Site, road type, time band, weekday or weekend

3.10 Data management

Paper forms will be checked for completeness at the end of each session, coded, and entered into a password-protected spreadsheet or electronic form (for example, KoBoToolbox or Google Forms with

restricted access). Ten percent of paper forms will be double-entered to check entry accuracy. Data will contain no direct identifiers and will be stored on encrypted devices accessible only to the investigators for five years after publication.

3.11 Statistical analysis

Data will be analysed in jamovi, a free, open-source statistical package (the version used will be reported). Significance will be set at $p < 0.05$ (two-sided).

- **Descriptive:** frequencies and percentages with 95% confidence intervals for categorical variables; means with standard deviations or medians with interquartile ranges for continuous variables, according to distribution (Shapiro–Wilk test).
- **Part A:** prevalence of any and correct helmet use with 95% CIs, overall and by site, road type, time band and weekday or weekend; comparisons using chi-square tests. Inter-observer agreement will be reported as Cohen's kappa, computed with an inter-rater agreement module from the jamovi library.
- **Observed vs self-reported:** for each interviewed rider, helmet status on arrival (observed by the interviewer) will be paired with self-reported "always" use; the difference will be tested with McNemar's test (jamovi: Frequencies, paired samples contingency tables).
- **Bivariate analysis:** chi-square or Fisher's exact tests for associations between candidate predictors and (a) helmet non-use and (b) crash-related head injury; t-test or Mann–Whitney U for continuous variables.
- **Multivariable analysis:** binary logistic regression for each outcome, including variables with $p < 0.20$ in bivariate analysis and those judged important a priori (age, hours per day, years in delivery). Results will be reported as adjusted odds ratios with 95% CIs. Multicollinearity will be checked with collinearity statistics (variance inflation factor), and model performance will be reported with the omnibus likelihood-ratio test, Nagelkerke R^2 and the area under the ROC curve. The number of predictors in each model will be limited to about one per 10 outcome events[18].
- **Missing data:** reported for each variable; complete-case analysis is planned if missing data are below 5%, otherwise multiple imputation will be considered.

4. Ethical considerations

- **Approval:** the protocol will be submitted to the Ethics Committee of the Faculty of Medicine, Alexandria University. No data will be collected before approval.
- **Observation component:** observation of behaviour in public places with no identifiers recorded. No photographs or videos of riders will be taken.
- **Informed consent:** interview participants will receive a verbal explanation of the study read from the standard Arabic consent script (Appendix C) and give verbal informed consent, documented by the interviewer on the form; written consent will be used instead if the committee requires it. Participation is voluntary, riders may stop at any time, and refusal has no consequence.
- **Confidentiality:** no names, telephone numbers, national ID numbers, employer account numbers or licence plates will be collected. Each form receives a study code only.

- **Minimal burden:** interviews will take place only while riders are waiting and will not exceed about 7 minutes.
- **Duty of care:** riders who report symptoms that may indicate an untreated or ongoing head injury (for example, persistent headache, repeated vomiting, confusion or weakness) will be advised to seek medical assessment and given a printed card (in Arabic) listing nearby emergency services.
- **Incentive:** no financial incentive is planned. A small token (for example, a road-safety leaflet) may be offered.
- **Conflict of interest:** the investigators have no affiliation with any delivery company or helmet manufacturer.

5. Field safety plan for data collectors

- Data collectors will stand only on pavements or other protected areas, never in the roadway, and will wear high-visibility vests.
- Observation will always be done in pairs; no one will collect data alone.
- Late-evening sessions will end by midnight and take place only at well-lit sites.
- Collectors will carry a letter from the faculty explaining the study, and the supervisor's contact details.
- Sessions will be stopped in heavy rain, poor visibility or any situation the team judges unsafe.

6. Potential sources of bias and how they will be minimised

Issue	Mitigation
Observer misclassification	Training with photographs, standard definitions, paired observation and kappa assessment
Hawthorne effect (riders notice observers)	Observers stand discreetly and do not wear study branding during observation
Selection bias (Part B)	Consecutive sampling at multiple sites and times; refusals counted and reported
Recall bias	12-month window, the standard in crash surveys; questions anchored to clear events (a crash or fall, a hospital visit); head-injury symptoms asked as a checklist rather than open recall
Social desirability bias (over-reporting helmet use)	Anonymity stressed; neutral, non-judgemental wording; interviews held away from employers and supervisors; self-report checked against helmet status observed on arrival
Interviewer variation (oral Arabic wording)	Several interviewers ask questions orally in Arabic from an English form; mitigated by agreed wording practised in training and the pilot, closed-ended response options, and recording the interviewer code on each form
Double-counting in observation	Each session is short and at a single intersection; possible duplicates acknowledged as a limitation
Limited generalisability	Several districts, road types and time bands; findings apply to Alexandria

Limitations: the cross-sectional design cannot establish causality; head injury is self-reported and not clinically confirmed; fatal crashes and seriously injured riders who are no longer working cannot be captured (survivor bias); fastening may be hard to judge at a distance; and because questions are asked orally in Arabic without a fixed written Arabic version, small differences in wording between interviewers are possible.

7. Timeline

Activity	M1–2	M3	M4	M5	M6–7
Finalise protocol and tools; ethics submission and approval	●				
Expert review of tools, team training and pilot		●			
Data collection, Parts A and B (maximum 3 months)		●	●		
Data entry, cleaning and analysis			●	●	
Manuscript writing and submission				●	●

M = month after study start. Dates will be fixed once ethics approval is obtained.

8. Budget

Item	Estimated cost (EGP)
Printing of forms, consent sheets and referral cards	[amount]
High-visibility vests and clipboards	[amount]
Transportation of data collectors	[amount]
Road-safety leaflets for participants	[amount]
Total (self-funded)	[amount]

9. Expected outcomes and dissemination

The study will provide the first observation-based estimate of helmet use among delivery riders in Alexandria, quantify the gap between reported and actual helmet use, and identify modifiable occupational factors. Findings will be submitted to a peer-reviewed journal and presented at student and national conferences. A short summary will be shared with the Faculty of Medicine and may be offered to relevant authorities and delivery companies to support helmet provision, rider training and enforcement.

Authorship

Authorship will follow the ICMJE criteria. The principal investigator will be first author; the order of other authors will be agreed before data collection begins.

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Appendix A. Roadside observation checklist

Site: _____ Road type: Arterial / Commercial / Residential Date: ____ Time band: Midday / Evening / Late Weekday / Weekend Observer: ____ Sheet no.: ____

No.	Helmet worn (Y/N)	Fastened (Y/N/?)	Type (FF/OF/NS)	Phone in hand (Y/N)	Passenger (Y/N)	Passenger helmet (Y/N)	Age group (<25/25–40/>40)
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							

FF = full-face; OF = open-face; NS = non-standard (half helmet, construction helmet, cap). "?" = fastening cannot be judged. Record only riders identifiable as delivery riders. Do not record names, faces or plates.

Appendix B. Interview questionnaire (asked orally in Arabic; answers recorded in English)

Form code: _____ Site: _____ Date: _____ Interviewer code: _____ Arrived wearing a helmet (interviewer observes): Yes / No

Section 1. About you

1. Age (years): ____
2. Sex: Male / Female
3. Marital status: Single / Married / Other
4. Highest education: None / Primary / Preparatory / Secondary / University student / University graduate
5. Nationality: Egyptian / Other: ____

Section 2. Your work

6. Who do you deliver for? Delivery app / Restaurant / Company / Freelance / More than one
7. How long have you worked in delivery? ____ years ____ months
8. Hours of delivery work per day: ____ Days per week: ____
9. How are you paid? Per order / Fixed salary / Both
10. Are you penalised or paid less if a delivery is late? Yes / No / Not sure
11. Do you own the motorcycle you use? Yes / No
12. Do you have a valid motorcycle driving licence? Yes / No / Prefer not to say

Section 3. Helmet

13. Do you own a motorcycle helmet? Yes / No
14. Did your employer provide a helmet? Yes / No
15. How often do you wear a helmet while delivering? Always / Most of the time / Sometimes / Rarely / Never
16. When you wear it, do you fasten the strap? Always / Sometimes / Never
17. If you do not always wear a helmet, why? (tick all) Heat / Uncomfortable / Short trips / Not necessary / Cost / Blocks hearing or vision / Hard with phone / Other: ____

Section 4. Riding behaviour (in a typical week)

18. Do you use your phone (calls, maps, app) while the motorcycle is moving? Often / Sometimes / Never
19. Do you ride faster than you feel is safe to deliver on time? Often / Sometimes / Never
20. Do you cross red lights or ride against traffic to save time? Often / Sometimes / Never

Section 5. Crashes in the past 12 months

21. In the past 12 months, have you had a crash or fall while riding? Yes / No (if No, go to end)
22. How many crashes? ____
23. In the most serious crash, were you wearing a helmet? Yes / No / Do not remember

24. Were you delivering an order at the time? Yes / No

Section 6. Head injury

25. In any of these crashes, did your head hit something? Yes / No
26. If yes, after the crash did you have (tick all): Loss of consciousness / Could not remember the crash / Confusion / Repeated vomiting / Severe headache / None of these
27. Did you go to a hospital or doctor because of the head injury? Yes / No
28. How many days were you unable to work after the most serious crash? ____

End: thank the rider. If the rider reports ongoing symptoms (headache, vomiting, confusion, weakness), advise medical assessment and give the referral card.

Appendix C. Verbal consent script

C1. Arabic version (read aloud to the rider)

السلام عليكم، أنا _____ من كلية الطب – جامعة الإسكندرية. بنعمل دراسة عن سلامة سائقي الدليفري واستخدام الخوذة. نحب نسألك شوية أسئلة قصيرة هتاخد حوالي ٥ دقايق.

مش هنسأل عن اسمك ولا رقم تليفونك ولا بيانات الشركة اللي بتشتغل معاها، وإجاباتك هتفضل سرية وهتُستخدم للبحث العلمي بس.

المشاركة اختيارية تمامًا، وتقدر توقف في أي وقت من غير أي مشكلة. توافق تشارك معانا؟

C2. English version (for the ethics committee)

"Hello. My name is ____, and I am a medical student at Alexandria University. We are doing a study on the safety of delivery riders and the use of helmets. I would like to ask you some short questions; it takes about 5 minutes. We will not ask for your name, phone number or employer details, and your answers will be kept confidential and used only for research. Taking part is completely voluntary, and you can stop at any time without any problem. Do you agree to take part?"

Consent given: Yes / No Interviewer initials: _____