

BMJ Open Mortality of elder financial and psychological abuse victims in rural Malaysia: a prospective cohort study

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ABSTRACT

Objectives To determine the longitudinal impact of elder financial and psychological abuse on risk of death among older Malaysians.

Design 7-year prospective cohort study. Baseline data were collected in late 2013 and respondents were followed up in June 2020.

Setting Kuala Pilah, Negeri Sembilan, Malaysia.

Participants 1927 community-dwelling older adults aged 60 or older randomly sampled from the national census. Individuals with severe cognitive impairment were excluded.

Outcome measure Mortality data were provided by the Malaysian National Registration Department and linked to respondents' national identification numbers. Kaplan-Meier curves and Cox regression were used to examine victims' survival periods and the impact of abuse on risk of death.

Results Overall, 450 respondents (23.4%) died after 7 years. Among financial and psychological abuse victims, death percentage was 25.8% compared with 23.3% among those who did not experience these types of abuse. Kaplan-Meier curves showed shorter survival among abuse victims, but Cox regression found no significant impact of financial and psychological abuse on mortality risk (HR 1.05, 95% CI 0.78 to 1.41). Among all the variables studied, only cognitive impairment led to higher mortality risk (HR 1.32, 95% CI 1.03 to 1.69).

Conclusion Our findings contradict prior empirical studies that supported the link between elder abuse and neglect (EAN) and mortality, even though we focused on two abuse subtypes. Results in this study are more in line with the recently emerging evidence that showed no association between EAN and mortality.

INTRODUCTION

On a global scale, approximately 15.7% of community-dwelling older adults reported having experienced abuse or neglect.¹ The current rapid population ageing, particularly in developing regions, is likely to escalate this problem as national responses to this phenomenon have not kept up with the speed of ageing.

STRENGTHS AND LIMITATIONS OF THIS STUDY

- ⇒ This study employed a prospective cohort design and obtained mortality data from the National Registration Department, an institution that retains the most comprehensive and latest vital statistics in Malaysia.
- ⇒ Financial and psychological abuse were measured using a widely validated tool, the modified Conflict Tactics Scale, which was administered by trained personnel through home visits.
- ⇒ The main limitation was that financial and psychological abuse were measured only once at baseline (and not repeated). There are possibilities that abuse did not continue or prolong.
- ⇒ The study population was limited to a single district in Negeri Sembilan.

Elder abuse and neglect (EAN) is defined as 'a single or repeated act, or lack of appropriate action, occurring within any relationship where there is an expectation of trust, which causes harm or distress to an older person'.² There are five types of EAN: physical abuse, psychological abuse, financial abuse, sexual abuse and neglect. Despite its prevalence, EAN is often under-reported, thus, the actual magnitude of the problem is likely to be higher than existing estimates.^{3,4}

Evidence on the adverse health impact of EAN has been growing in recent decades. Mistreatment by trusted ones has been associated with mental health outcomes such as depression, anxiety, sleep disturbances and suicidal ideation.⁵ EAN victims were also found to use healthcare services more frequently, and have greater risks of hospitalisation and nursing home placement.⁶ Other than that, abuse and neglect in late life have been associated with different forms of physical complaints including allergic symptoms,

bodily pain, digestive problems, headache, incontinence and many more.^{5 6} These negative health consequences can be a result of direct assaults (eg, physical abuse) or indirect and prolonged subtle victimisation (eg, psychological or financial abuse), which acts as a source of chronic stressor that gradually weakens the immune system and predispose victims to illness.^{7 8}

Among the myriad health impacts of EAN, early death or premature mortality is among the most consistently documented in empirical studies. Dong *et al* and Lachs *et al* found mortality risks among EAN victims in the USA - two to three times higher when compared with older adults who were not abused.^{9 10} Baker *et al* corroborated this finding among older women in the USA who were physically and verbally abused.¹¹ Similarly, Schofield *et al* reported higher mortality risks among Australian older women who were deemed 'vulnerable to abuse' compared with those who were not vulnerable.¹²

On the contrary, a recently published study by Pillemer *et al* found no relationship between EAN and premature mortality. The study was conducted among 4156 older adults in New York and employed a 10-year prospective cohort design. The explanatory variables were EAN as a whole, EAN severity and EAN subtypes—all of which did not demonstrate any impact on risk of mortality.¹³ The authors argued that prior evidence on the link between EAN and premature death was questionable due to issues related to sampling (eg, selection bias), measurement of abuse (eg, the tool or questionnaire used to assess EAN) and potential effects of confounders such as nursing home placement.¹³

Among the five EAN subtypes, financial and psychological abuse have been found to be the most prevalent.^{1 14 15} Financial abuse refers to 'the illegal, unauthorised or improper use of an elder's money, benefits, belongings, property or assets for the benefit of someone other than the older adult', while psychological abuse is defined as 'verbal or nonverbal behaviours that inflict anguish, mental pain, fear or distress on an older adult'.¹⁶ Examples of financial abuse acts include preventing an older adult from accessing his money or property, cheating or forcing an older adult into handing over his money or property, abusing the power of attorney given by an older adult, and many more. Acts that comprise psychological abuse, on the other hand, include using harsh words repeatedly, belittling or humiliating, threatening and deliberately isolating an older adult.

In this paper, we aim to examine the longitudinal relationship between financial and psychological abuse with risk of mortality among older Malaysians. We hypothesised that abuse victims have a higher risk of mortality than those who are not abused.

METHODOLOGY

Study design and setting

This was a prospective cohort study of 6–7 years conducted among randomly selected older adults in the Kuala Pilah

district of Negeri Sembilan, a state in Malaysia. Baseline data were derived from the Malaysian Elder Mistreatment Project (MAESTRO), and collected between November 2013 and April 2014.¹⁷ Subsequently, mortality was traced in June 2020 using data provided by the National Registration Department (NRD).

Kuala Pilah is one of the seven districts of Negeri Sembilan, other districts being Jelebu, Jempol, Port Dickson, Seremban, Rembau and Tampin. Negeri Sembilan is one of thirteen states in Malaysia and located in the west coast of Peninsular Malaysia. Kuala Pilah has a size of 103 020 hectares¹⁸ with approximately 66 000 residents.¹⁹ Those aged 60 and over constitute 14.5% of Kuala Pilah population, higher than other districts in the state.¹⁹

Sampling strategy

At baseline, a multistage cluster sampling strategy was employed to select study subjects. In the first stage, Kuala Pilah was chosen from the seven districts of Negeri Sembilan. In the second stage, with the help of the Department of Statistics Malaysia (DOSM), the district was divided into 254 artificially created enumeration blocks (EBs). Each EB contained 80–120 living quarters. A total of 156 EBs were then randomly selected. This was followed by another random selection of 16–20 households from every EB based on a computer-generated list, which altogether yielded 2496 older persons. Each household was represented by one older adult. These individuals were then identified in a house-to-house visit conducted using local terrain maps provided by the DOSM. Those who agreed to participate and fulfilled the inclusion criteria were interviewed. The complex sampling design aimed at ensuring adequate coverage and obtaining a heterogeneous and representative sample from the target population. Further details on sampling strategy have been published earlier.¹⁷

The sampling procedure is illustrated in a flowchart diagram in online supplemental appendix 1.

Sample size calculation

For this study, sample size calculation was done using the Open Epi online sample size calculator for prospective cohort design: (1) significance level was set at 95%; (2) power was set at 80%; (3) ratio of unexposed to exposed ('exposed' refers to those who experienced abuse or neglect) was derived from a local study that measured EAN prevalence among older adults in Kuala Lumpur,²⁰ yielding a value of 9.42 and (4) percentage or rate of those exposed with outcome and those unexposed with outcome ('outcome' refers to mortality) were derived from a study by Dong *et al*, which gave a value of 5.91 and 13.49, respectively.¹⁰ With 20% inflation, the needed sample size was 1604.

Study population

The study included all community-dwelling older adults—defined as those aged 60 and over—who have been

residing in Kuala Pilah for the past 12 months (minimum period) or more. Exclusion criteria were:

1. Non-citizens.
2. Those living in institutions (eg, nursing homes).
3. Those who are unable to communicate independently (eg, stroke patients having speech trouble, older adults with severe hearing impairment).
4. Those with severe cognitive impairment, assessed using the Elderly Cognitive Assessment Questionnaire (ECAQ).²¹

Data collection

The researchers and a group of trained research assistants conducted face-to-face interviews using a structured questionnaire (that contained all the relevant scales) through a house-to-house visit. During the visit, older adults are interviewed in private, without the presence of family members. Prior to the interview, the research team explained to all respondents about the nature and objective of the study, and obtained a verbal and written consent from each of them. All research assistants underwent a series of training before joining the study.

A verbal and written consent was taken from each respondent, and the research team explained to all that participation was voluntary and withdrawal was possible at any time. During the interview, when abuse victims were detected, interviewers would offer their assistance in referring the victims to the nearest health clinic and social worker. If the respondent agreed, referral would be arranged. If the respondent refused any intervention, his/her autonomy would be respected and the interviewer would merely provide information on how to seek help, should the respondent change his/her mind in the future.

Variables and tools

The explanatory variable in this study was EAN (with a focus on psychological and financial abuse), measured using the Malay version of the modified Conflict Tactics Scale (CTS).²² The outcome variable was mortality, determined using data provided by the NRD.

ELDER ABUSE AND NEGLECT

The operational definition of EAN was based on the National Study of Elder Abuse and Neglect in Ireland,²³ with slight adaptations to the local context. While the National Study of Elder Abuse and Neglect in Ireland defines abuse by restricting the occurrences within the last 12 months, this study took into account all experiences of abuse and neglect in late life—from the age of 60 and onwards. This approach of measuring elder abuse has been used in prior studies.^{24 25}

Financial abuse was operationally defined as any one occurrence since the age of 60, as reported by the elder respondent, if this was perpetrated by someone

in a position of trust such as family members, friends or neighbours. Psychological abuse was defined as ten or more occurrences within a year since the age of 60, as reported by the elder respondent, if this was perpetrated by someone in a position of trust. When there were less than ten such occurrences within a year, psychological abuse and neglect were still established if the episode(s) was perceived by the older adult as having a serious impact.

The questionnaire was derived from the modified CTS and revised by Naughton *et al.*^{17 23} Few items were modified to contextualise elder abuse in Malaysian society. Content validation was then done through the opinion of two public health experts and two social workers. This was followed by translation and back-translation, and face validation. The instrument was finally pretested among 343 older individuals in Kuala Lumpur and Selangor via purposive sampling. Internal consistency was assessed using Cronbach's alpha (CA) reliability coefficient. For overall abuse, the CA was 0.54.²⁶ Details of the methodology of the MAESTRO study have been published earlier.^{17 22}

Financial and psychological abuse were operationalised as follows:

- a. Financial abuse: one or more episodes of abuse or exploitation occurring since the respondent turns 60 years, by a family member or someone in a position of trust. Nine questions are used to capture the occurrence(s), with a binary response of 'yes' and 'no'.
 1. Has anyone stolen your money/things/property or documents?
 2. Has anyone prevented you from accessing your money/things property or documents?
 3. Has anyone forced or cheated you into handing over your money/things/property or pension book against your will?
 4. Has anyone forced or cheated you into handing over the rights to your house/property or pension book against your will?
 5. Has anyone forced or cheated you into altering your will or any other financial document against your will?
 6. Has anyone signed your name on a cheque/pension book/any financial documents against your will?
 7. Has anyone misused the power of attorney given by you or forced/tricked you into signing over powers of attorney?
 8. Has anyone tried to or forced you to (but failed) in any of the previous attempts?
 9. Has anyone stopped contributing to household expenses such as rent or food which was previously agreed on?
- b. Psychological abuse: a minimum of 10 (or more) incidents within 1 year since the respondent turns 60, perpetrated by someone in a position of trust. Alternatively, abuse was considered to have occurred if less than 10 incidents took place within a year but

they were perceived by respondents as having serious impacts. The following questions were then asked:

1. Has anyone called you harsh words, sworn at you or cursed at you?
2. Has anyone verbally threatened you?
3. Has anyone belittled you or put you down?
4. Has anyone repeatedly ignored you or didn't involve you?
5. Has anyone ever threatened to harm your loved ones?
6. Has anyone ever prevented you from seeing your loved ones, or even a doctor or nurse?
7. Has anyone ever removed or prevented you from accessing your hearing or walking aids?

These were followed by 'how frequent' the episode(s) is. Choices of answers were 'once', '2–9 times' and '10 or more times'.

Mortality

Mortality—or death—is a unique and clearly defined event, which gives an instant depiction (though not entirely) of health status. In this study, all respondents—those with or without experience of EAN—were tracked approximately 6–7 years (79 months) following the completion of baseline assessment. This was done using data provided by the NRD, which is the only institution in Malaysia that retains the latest and most complete information on national birth and death statistics. Tracing was done using the National Registration Identity Card Number, a unique number assigned to each Malaysian citizen.

In Malaysia, death reporting is mandatory before burial can take place. Reports are usually made directly by hospitals (healthcare providers) or by individuals to local authorities such as police. The standard gap between reporting of deaths and incorporation into the National Registry Department database is 3 days maximum.

Covariates

Other variables included in this study were socio-demographic characteristics (age, gender, education level, marital status, household income and living arrangements), health-related variables (self-rated health and number of chronic diseases) and psychosocial variables (depression, social isolation and cognitive status).

Education level was categorised into 'low' (no formal education), 'medium' (primary to secondary) and 'high' (college and above), while monthly household income was categorised into 'low' (below RM1000), 'middle' (RM1000–RM2499) and 'high' (RM2500 and above). Chronic diseases (comorbidities) were based on self-report, but verified through asking caregivers and/or other family members and checking hospital/clinic appointment cards and medication prescriptions. Depression was measured using the Geriatrics Depression Scale and scores were initially classified as 'normal' (0–5), 'probable depression' (6–9) and 'depression' (≥ 10).^{10–15 27} In regression models, the former two groups

were considered as not having depression, while the latter was considered as depressed. The Lubben Social Network Scale (LSNS)²⁸ and ECAQ¹⁹ were used to assess social isolation and cognitive function, respectively. For ECAQ, scores range from 0 to 10. A score of 0–4 indicates probable cognitive impairment, 5–6 borderline and seven and above as normal.²⁹ In this study, we excluded those whose ECAQ scores were four or less. Subsequently, among study respondents, those who scored 5–6 were considered as having cognitive impairment while those who scored seven or more were considered as having intact cognition. For LSNS, scores range between 0 and 30, and a score of 12 or lower indicates social isolation.

Analytical approach

Descriptive statistics were used to measure the prevalence of financial and psychological abuse. Continuous variables were reported in means and SD while categorical variables were reported in frequencies and percentages. Correlations between two numerical variables were measured using the Pearson's correlation coefficient while associations between two or more categorical variables were tested using χ^2 tests.

Kaplan-Meier survival curves were constructed to enable 'time-to-event' analysis and comparison of survival time between those abused and not abused. HRs, along with 95% CI were then computed using Cox proportional hazard regression models to determine the longitudinal impact of financial and psychological abuse on risks of mortality. Key assumptions of Cox regression—non-informative censoring and proportional hazards—were tested prior to running regression analyses, using methods suggested by Ranganathan and Pramesh, and Delgado *et al.*^{30 31}

Patient or public involvement

The public were involved in the dissemination plans of our research. We have used our earlier published results (from the same study/project) to inform the public and raise awareness. This was done through public campaigns, television forums, radio talks, newspaper articles and social media platforms. The results of this paper will be disseminated through infographic reports that would be made available to lay readers, newspaper articles and public forums.

RESULTS

A total of 2118 respondents were interviewed at baseline. Older adults who were found to have severe cognitive impairment ($n=191$) were excluded, giving a final sample size of 1927. The mean age of our respondents was 69.8 (SD:6.9) and 60.8% were female. The prevalence of financial abuse was 4.8%, and this was the most common form of EAN. Psychological abuse stood second at 3.4%. When the definition of financial abuse is expanded—meaning perpetrators not known to the victims (strangers) are

included—the prevalence of financial abuse increased to 10.5%.

Table 1 shows the basic characteristics of our study respondents.

Tracking of mortality status in June 2020 showed that 23.4% (450) died in the course of 6–7 years. Death percentage was 24.7% among EAN victims (of any type) compared with 23.3% among those who never experienced EAN. Meanwhile, death percentage among financial and psychological abuse victims was 25.8% compared with 23.3% among those who did not experience these types of abuse.

Kaplan-Meier curves demonstrated a visible gap between the survival period of elder financial and psychological victims compared with those who did not experience abuse. However, log rank test was not statistically significant ($\chi^2=0.58$, $p=0.45$). In the course of 6–7 years (or approximately 79 months), the mean survival period for financial and psychological victims was 50 months in comparison to 54 months for those not abused.

Figure 1 illustrates the survival periods of financial and psychological abuse victims compared with non-victims.

Cox regression (proportional hazard regression) was then run to determine if financial and psychological abuse increased the risks of mortality after adjusting for other potential confounders. Table 2 presents the results of Cox regression analyses.

From table 2, financial and psychological abuse did not lead to higher risks of mortality after adjusting for other confounders (HR 1.05, 95% CI 0.78 to 1.41). Only cognitive impairment was found to have a significant impact on risk of premature death among our study respondents (HR 1.32, 95% CI 1.03 to 1.69).

DISCUSSION

The overarching aim of this study was to determine the longitudinal impact of elder financial and psychological abuse on risk of mortality. We found no relationship between the two EAN subtypes—financial and psychological abuse—with risk of mortality. This contradicted findings from prior studies which have largely corroborated the impact of EAN on the risk of death.^{9–12} Our findings are more in line with the newly emerging evidence from the US (older populations in New York) that disproved this link.¹³

Cognitive impairment was the only significant predictor of mortality, a similar finding reported in previous studies. For instance, Chinese older adults who were frail and cognitively impaired were found to have higher risk of mortality,³² while Taiwanese older adults who showed cognitive impairment at baseline had higher risks of death after a 6-year follow-up.³³ Similarly, a study among long-term care residents in the USA demonstrated a longitudinal relationship between cognitive decline and mortality,³⁴ while an inverse and dose–response relationship between cognitive function and mortality was reported among older adults in Spain.³⁵

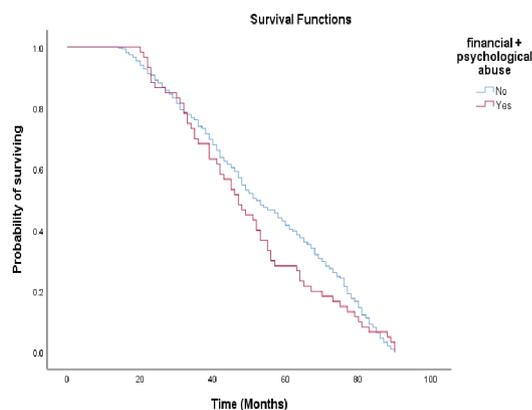
Table 1 Basic characteristics of study respondents (n=1927)

Variable	N (%)
Sex	
Male	755 (39.2)
Female	1172 (60.8)
Age group†	
60–69	980 (50.9)
70–79	769 (39.9)
80 and over	177 (9.2)
Education level†	
Low	238 (12.4)
Medium	1638 (85.3)
High	44 (2.3)
Marital status	
With spouse	1295 (67.2)
Without spouse	632 (32.8)
Household income*†	
Low	1222 (64.1)
Middle	612 (32.1)
High	71 (3.7)
Living arrangement†	
With children	874 (45.9)
With others	813 (42.7)
Alone	219 (11.5)
Self-rated health†	
Poor	535 (27.8)
Good	1389 (72.2)
Cognitive impairment†‡	
Yes	407 (21.2)
No	1510 (78.8)
No. of chronic illnesses†	
None	598 (31.2)
1–2	859 (44.8)
3 or more	460 (24.0)
Depression†	
Yes	222 (11.8)
No	1666 (88.2)
Social isolation†	
Yes	349 (18.2)
No	1567 (81.8)

*The median monthly income in Malaysia ranged from RM3626 to RM4585 during the baseline study period (2013–2014), with varying figures from state to state. Negeri Sembilan (NS) has lower median income than the national figure. In 2014, 17% of households in NS were considered low-income. Our sample showed a higher percentage of low-income households (60.4%). This is in line with findings from local studies that showed: (1) higher poverty rates among older populations and (2) households headed by older adults comprised approximately 60% of the low-income group in Malaysia.

†In some variables, N did not add up to 1927 due to missing data.

‡Cognitive impairment here refers to mild-moderate only, as those with severe cognitive impairment were excluded from the interview at baseline.



Log Rank (Mantel-Cox): Chi-square = 0.58, p-value = 0.45

Figure 1 Kaplan-Meier curve of financial and psychological abuse victims versus non-victims.

The lack of association between EAN and mortality in this study could reflect the true nature of EAN trajectory, or it could be explained by factors related to abuse measurement, or the effect of confounding factors which were not captured. For example, a loose measurement of EAN that did not take into account level of severity may yield non-significant results, while stratification in analysis (eg, by categorising EAN victims into mild and severe) may give more accurate findings. Some variables can act as 'buffers' against premature mortality (despite abuse experiences), but are not measured. These include social support, resilience, physical exercise and healthy dietary habits.^{36–38} Social support for instance, has been shown to reduce mortality risks in old age, through protecting older adults from frailty and depression.^{39–41} Likewise, older adults with greater resilience were found to have lower mortality risks, which could be explained by how resilience affects one's worldview, lifestyle behaviours and quality of life.^{38, 42} In addition, EAN status was assessed only at baseline, and was not repeated at any other time point. The dynamic/ fluid nature of EAN (it is possible that abuse did not continue or prolong) could have contributed to this lack of association.

Beyond the discussion of mortality as a potential sequel of abuse, it is perhaps equally important to underscore the value of quality of life and life satisfaction in old age rather than merely living longer.⁴³ While premature mortality is generally regarded as a 'negative' outcome, living longer is not necessarily a 'positive' one either. This is because longevity—in the context of elder abuse or otherwise—are not always indicative of greater quality of life or higher sense of happiness. In fact, the contrary is possible. Elder abuse victims may live as long as their counterparts who never experience abuse or even longer, for different reasons (eg, free of chronic illness) but suffer from poor sleep, chronic stress or depressive symptoms—all of which can be easily overlooked if excessive focus is given to mortality as an outcome.

This study has several limitations. First, respondents with severe cognitive impairment were excluded at baseline.

Table 2 Cox regression to determine the impact of financial and psychological abuse on mortality

Variables	HR	95% CI
Financial or psychological abuse		
No (ref)	–	
Yes	1.05	0.78 to 1.41
Gender		
Male (ref)	–	
Female	0.934	0.69 to 1.26
Age group		
60–69 (ref)	–	
70 and above	0.99	0.80 to 1.23
Education level		
Low (ref)	–	
Medium	1.07	0.78 to 1.47
High	1.00	0.67 to 1.50
Marital status		
Without spouse (ref)	–	
With spouse	1.10	0.85 to 1.41
Income status		
High (ref)	–	
Middle	0.91	0.71 to 1.18
Low	1.08	0.84 to 1.39
Living arrangement (with children)		
Yes (ref)	–	
No	1.06	0.84 to 1.33
Self-rated health		
Poor (ref)	–	
Good	0.82	0.67 to 1.01
Cognitive impairment		
No (ref)	–	
Yes	1.32	1.03 to 1.69*
Number of chronic illnesses		
0 (ref)	–	
1–2	1.03	0.81 to 1.32
3 or more	1.09	0.83 to 1.44
Depression		
No (ref)	–	
Yes	0.99	0.80 to 1.21
Social isolation		
No (ref)	–	
Yes	1.06	0.84 to 1.33
Omnibus test of model coefficients: $\chi^2=17.58$, $p=0.35$. * $p<0.05$ (statistically significant), $n=1916$, (ref)=reference group.		

Given that cognitive impairment is a known risk factor for EAN, this could have led to an underestimation of the prevalence of abuse and number of deaths. We were not able to predict or measure to what extent this could have affected our study results. Second, the method of abuse assessment did not capture severity of abuse. This lack

of discretion may have influenced our results, as the risk of premature mortality could be more substantial when abuse is more severe. Third, our sample was limited to a single district in Negeri Sembilan, therefore, they might not represent the Malaysian older population as a whole. Other than that, we did not consider earlier adverse experiences (eg, abuse during adulthood or childhood). This is worth highlighting as evidence shows associations between childhood adversity and EAN⁴⁴; cumulative effects of abuse over lifetime may influence mortality risks. Lastly, some of the variables included in the regression model—such as depression and social isolation—can also act as mediators or moderators in the relationship between abuse and mortality but these potential effects were not tested.

CONCLUSION

Contrary to our hypothesis, this paper found no relationship between financial and psychological abuse and risk of premature mortality. Our findings are more in line with the newly emerging evidence from the USA that showed no association between EAN and mortality. However, given the small body of evidence that supports this lack of relationship, more studies—in different settings and populations—need to be conducted/replicated to enable researchers to pool results and draw more accurate conclusions. Future studies should include factors or variables that can potentially buffer against the risk of mortality while studying EAN outcomes. This will give us a better understanding of how mortality can be reduced or avoided, and how greater support or intervention can be provided for victims of abuse and neglect.

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SZJ wrote the first draft of the manuscript. All authors participated in the editing process and have approved the final version of the manuscript. WYC and NNH are responsible for the overall content as the guarantor.

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Competing interests None declared.

Patient and public involvement Patients and/or the public were involved in the design, or conduct, or reporting, or dissemination plans of this research. Refer to the Methods section for further details.

Patient consent for publication Not applicable.

Ethics approval This study involved human participants and was approved by the University of Malaya Research Ethics Committee (UM.TNC2/UMREC-268). Participants gave informed consent prior to participation in the study.

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement Data are available on reasonable request. Request can be made through the corresponding author. However, mortality data from the National Registration Department were used under license and restrictions were applied for the current study, thus are not publicly available.

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