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Absence of *Helicobacter pylori* is not protective against peptic ulcer bleeding in elderly on offending agents: lessons from an exceptionally low prevalence population

Aim *Helicobacter pylori* (*H. pylori*) infection is exceptionally rare in population from the north-eastern region of Peninsular Malaysia. This provides us an opportunity to contemplate the future without *H. pylori* in acute non-variceal upper gastrointestinal (GI) bleeding.Methods All prospective cases in the GI database registry with GI bleeding between 2003 and 2006 were reviewed. Cases with confirmed non-variceal aetiology were analysed. Rockall score > 5 was considered high risk for bleeding and primary outcomes studied were in-hospital mortality, recurrent bleeding and need for surgery. Results The incidence of non-variceal upper GI bleeding was 2.2/100,000 person-years. Peptic ulcer bleeding was the most common aetiology (1.8/100,000 person-years). In-hospital mortality (3.6%), recurrent bleeding (9.6%) and need for surgery (4.0%) were uncommon in this population with a largely low risk score (85.2% with score ≤5). Elderly were at greater risk for bleeding (mean 68.5 years, P = 0.01) especially in the presence of duodenal ulcers (P = 0.04) despite gastric ulcers being more common. NSAIDs (34%) and aspirin (22.8%) were the main risk factors. Conclusions The absence of *H. pylori* infection may not reduce the risk of peptic ulcer bleeding in the presence of risk factors especially offending drugs in the elderly.

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ORIGINAL ARTICLE

Absence of *Helicobacter pylori* is not protective against peptic ulcer bleeding in elderly on offending agents: lessons from an exceptionally low prevalence population

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Running title: non-*H. pylori* ulcer bleeding in elderly

ABSTRACT

Aim *Helicobacter pylori* (*H. pylori*) infection is exceptionally rare in population from the north-eastern region of Peninsular Malaysia. This provides us an opportunity to contemplate the future without *H. pylori* in acute non-variceal upper gastrointestinal (GI) bleeding.

Methods All prospective cases in the GI database registry with GI bleeding between 2003 and 2006 were reviewed. Cases with confirmed non-variceal aetiology were analysed. Rockall score > 5 was considered high risk for bleeding and primary outcomes studied were in-hospital mortality, recurrent bleeding and need for surgery.

Results The incidence of non-variceal upper GI bleeding was 2.2/100,000 person-years. Peptic ulcer bleeding was the most common aetiology (1.8/100,000 person-years). In-hospital mortality (3.6%), recurrent bleeding (9.6%) and need for surgery (4.0%) were uncommon in this population with a largely low risk score (85.2% with score ≤ 5). Elderly were at greater risk for bleeding (mean 68.5 years, $P = 0.01$) especially in the presence of duodenal ulcers ($P = 0.04$) despite gastric ulcers being more common. NSAIDs (34%) and aspirin (22.8%) were the main risk factors.

Conclusions The absence of *H. pylori* infection may not reduce the risk of peptic ulcer bleeding in the presence of risk factors especially offending drugs in the elderly.

Keywords: elderly, *Helicobacter pylori*, Malays, peptic ulcer, upper gastrointestinal bleeding

INTRODUCTION

Non-variceal upper gastrointestinal (GI) bleeding remains a prevalent condition and its mortality hardly change despite declining trend of peptic ulcer disease and improvement in therapeutic approaches. The reported incidence from North America and Europe was between 20 and 60/100,000 populations but data from Asia were unfortunately scarce and variable.[1] A recent report from Thailand indicates an incidence of 152.9/100,000 population[2] and data from East Malaysia (State of Sabah), available only in abstract, indicate an incidence of 72/100,000 population.[3] Reports from two tertiary hospitals in central Peninsular Malaysia indicates an overall low prevalence of non-variceal upper GI bleeding among the ethnic Malays,[4, 5] possibly due to a low prevalence of peptic ulcer disease in this population.[6]

There is a reducing trend of peptic ulcer disease observed within Asia, and this is largely a result of reducing prevalence of *H. pylori* infection. This trend is likely to continue into the future and a time will come when *H. pylori* joins the ranks of smallpox and polio.[7] The population in the north-eastern region of Peninsular Malaysia (state of Kelantan), that consists of 90% ethnic Malays, has a seroprevalence of *Helicobacter pylori* (*H. pylori*) infection of only 4.2% among 496 blood donors and 4.8% among 921 patients attending a health screening clinic.[8] The *H. pylori* infection rate reported from gastric biopsies was 20% in duodenal ulcer, 21.2% in gastric ulcer, 16.7% in duodenal erosion and 17.1% in gastric erosion.[9] The incidence of peptic ulcer perforations within the region from 1991 to 92 was only 1.5/100,000 person-years.[8]

The exceptional low prevalence of *H. pylori* in the population from north-eastern region of Peninsular Malaysia provides us an opportunity to contemplate the future without the infection. Our study aimed to determine the risk and clinical outcomes of acute non-variceal upper GI bleeding in this population with low prevalence of *H. pylori* infection. The association between clinical characteristics, risk factors and treatment given with risk and bleeding outcomes was also assessed.

METHODS

Study population

We reviewed and analysed all prospective cases with a diagnosis of GI bleeding between 2003 and 2006 in our GI registry database. Cases were admitted in a tertiary university hospital (Hospital XXX) situated in the north-eastern region of Peninsular Malaysia (State of Kelantan). The region consists of 0.7 to 0.8 million of population (2003 – 2006) with a diverse racial background but has a predominant Malay population of approximately 90%.

All adults above 18 years old with upper GI bleeding as a diagnosis in the GI registry were then screened for inclusion. Subjects with typical symptoms and signs and subsequently requiring upper endoscopy after informed consent and confirmed to have non-variceal causes of acute upper GI bleeding were included into the analysis. Upper endoscopy was performed in all cases within 24 hour upon admission. *H. pylori* status, where available, detected by either CLO test and or histology during endoscopy, would also be recorded. Exclusion criteria included those patients with lower GI bleeding, variceal bleeding, bleeding due to underlying hematologic disorders, GI bleeding of unknown origin, and those patients who did not have an endoscopy examination.

The study was approved by the Human Ethics Committee of Universiti Sains Malaysia.

Study outcome and definitions

Rockall score[9] was utilised to classify study population into low risk (score ≤ 5) and high risk (score > 5)[10] for non-variceal upper GI bleeding. Briefly, Rockall score is made up of five variables, three of which are clinical parameters (age, shock and co-morbidities) and the other two endoscopic features (causative lesions and stigmata of recent haemorrhage).[9,11] Each variable can be scored between 0 and 3, with a maximum score of 15 for all 5 variables.

The primary study outcome was to determine risk based upon the Rockall score, in-hospital mortality, recurrent bleeding and the need for surgery in this population with non-variceal upper

GI bleeding. The secondary outcome was to determine the association between primary outcomes with clinical characteristics, risk factors, endoscopic features and endoscopic treatment given.

In-hospital mortality was defined as death during the period of hospital stay which was directly associated with upper GI bleeding and this was compared to patients still alive after 30 days. Recurrent bleeding was defined as new episode of bleeding during the period of hospital stay after index bleeding had stopped, manifested as recurrence of symptoms and signs (fresh blood in nasogastric aspirate) of bleeding and this was compared to those without bleeding after index event. The need for surgery was defined as the need to undergo laparotomy after failure of endoscopy interventions to stop bleeding and this was compared to those patients not needing any surgical interventions after index bleed.

Data and statistical analysis

Data were presented in frequency and percentages unless otherwise stated. Statistical analysis was performed with SPSS version 19.0 (SPSS Inc., Chicago, IL, USA). Univariable and multivariable analyses were used to test the association between variables. Receiver operating characteristics (ROC) curve was utilised to determine the usefulness of Rockall score in predicting the primary outcomes in this study population. A P value of < 0.05 was considered statistically significant for all analyses.

RESULTS

Incidence of upper GI bleeding and study population characteristics

During the study period between 2003 and 2006, a total of 742 patients (incidence 6.5/100,000 person-years) were registered in the database with a diagnosis of GI bleeding. Of 742 patients, 250 patients (2.2/100,000 person-years) were subsequently identified and confirmed to have non-variceal upper GI bleeding. The incidence of non-variceal bleeding was relatively similar between gender with 1.3/100,000 person-years in men and 1/100,000 person-years in women. Peptic ulcer bleeding was the primary aetiology of non-variceal bleeding in 204 patients (1.8/100,000 person-years or 81.6% of total cases), of which 54% of cases were due to gastric ulcer bleeding (Table 1). Only 2 cases were *H. pylori* positive and both cases were of non-Malays in origin. The mean age of 250 patients was 62.1 years (range 15 – 97 years) with older patients, at a mean age of 68.5 years, tended to have a higher risk score ($P = 0.01$).

Primary outcome

Majority of patients were of low risk on admission with 85.2% (213/250) of patients had a Rockall score ≤ 5 and a mean Rockall score of 4.4. There were 3.6% (9/250) in-hospital mortality, 9.6% (24/250) recurrent bleed and 4.0% (10/250) of patients who subsequently required surgery. A higher Rockall score in this population was associated with increased in-hospital mortality (mean score 7.0, $P < 0.001$), recurrent bleeding (mean score 5.1, $P = 0.01$) and need for surgery (mean score 4.8, $P = 0.01$). A Rockall score > 5 was significant in predicting recurrent bleeding in this population but only with area under curve or AUC of 0.6 (95% CI: 0.5-0.7, $P = 0.04$) (Figure 1).

Secondary outcome – clinical features, co-morbidities and other risk factors (Table 1 and 2)

Peptic ulcer bleeding was more likely to re-bleed ($P = 0.04$) during hospitalisation (Table 1). Duodenal ulcers (DU) were more likely to occur in the elderly (mean 66.2 years, $P = 0.04$) but no difference in age was noted with gastric ulcers (GU) (mean 61.1 years with gastric ulcers vs. 63.2 years without gastric ulcers, $P = 0.3$). DUs, but not GUs or gastroduodenal ulcers/erosions, were also associated with a higher risk score, mortality, recurrent bleeding and need for surgery (all $P < 0.05$).

Symptoms of anaemia was associated with risk of recurrent bleeding ($P = 0.002$) and need for surgery ($P = 0.02$) and epigastric pain was associated with increased need for surgery ($P = 0.005$) (Table 1). A low hemoglobin level was associated with a higher risk score, in-hospital mortality, recurrent bleeding and need for surgery (all $P < 0.05$). Recurrent bleeding was more common in those patients with a raised urea ($P = 0.03$) and creatinine ($P = 0.03$). A raised urea was also more likely to be associated with in-hospital mortality ($P = 0.04$).

Both chronic liver disease and septicaemia was significantly associated with increased in-hospital mortality and recurrent bleeding (all $P < 0.05$) (Table 2). History of previous peptic ulcer disease was associated with a higher risk score on admission ($P = 0.02$). More than 1/3 of patients reported NSAIDs use but on its own, it was not associated with any of the studied outcomes on univariate analysis (Table 2). Aspirin use was associated with recurrent bleeding ($P = 0.02$) but warfarin use was associated in-hospital mortality ($P = 0.02$) (Table 2).

Secondary outcome – endoscopic features and treatment (Table 3)

Major stigmata of recent hemorrhage (SRH) were present in 26% of all bleeding and its presence was associated with a higher risk score, in-hospital mortality, recurrent bleeding and

need for surgery (all $P < 0.05$). More than half were Forrest III lesions (57.2%) and GUs rather than DUs were frequently Forrest III (41.2% vs. 8.4%). However, only Forrest III DUs were associated with recurrent bleeding ($P = 0.04$). DUs were also more likely than GUs to have Forrest I lesions (6.8% vs. 3.6%). Likewise, DUs rather than GUs were associated with a higher risk score, mortality, recurrent bleeding and need for surgery (all $P < 0.05$). GUs were more common than DUs to have Forrest II lesions (9.6% vs. 4.4%) but both were associated with a higher risk score (both $P = 0.01$).

All patients admitted with GI bleeding received PPI used but there was no difference in outcomes between omeprazole and pantoprazole. Blood transfusion was needed in 76% of all bleeding and its requirement was associated with risk of recurrent bleeding ($P = 0.001$). Endoscopic interventions were employed in 38.4% of all bleeding, with a third of these being performed in high risk patients. Of all patients with bleeding, adrenaline was the sole intervention in 17.2%, adrenaline with coagulation in 13.2% and adrenaline with clip in 8%. Use of adrenaline only was associated with a higher risk score, recurrent bleeding and need for surgery (all $P < 0.001$). Likewise, adrenaline with clip therapy was associated with a higher risk score, recurrent bleeding and need for surgery (all $P < 0.005$). Adrenaline with coagulation therapy was associated with recurrent bleeding ($P = 0.02$) and need for surgery ($P = 0.005$).

Secondary outcome – multivariable analysis (Table 4)

Of the variables associated with a high Rockall score, major SRH was the factor most predictive of high risk in this population (OR 25.2, 95% CI 8.5-74.3). This variable was also associated with increased in-hospital mortality (OR 11.0, 95% CI 1.9 – 62.1). Likewise, septicaemia was associated with a high risk score (OR 15.4, 95% CI: 2.9 – 81.1) and in-hospital mortality (OR 27.1, 95% CI: 4.5-162.8). Warfarin use was the other risk factor associated with in-hospital mortality (OR 16.7, 95% CI 2.1 – 132.5). Use of adrenaline only during endoscopic intervention was the factor most associated with increased risk of recurrent bleeding (OR 4.4, 95% CI: 1.5–12.7) and need for surgery (OR 9.8, 95% CI: 2.3-43.9). Another factor associated with recurrent bleeding was a raised creatinine (OR 1.002, 95% CI: 1.0-1.004). Epigastric pain was highly predictive for increased need of surgery in this population (OR 6.3, 95% CI 1.2-32.2).

DISCUSSION

In this population starting with an exceptionally low prevalence of *H. pylori* infection, the incidence of 2.2/100,000 person-years of non-variceal upper GI bleeding was also low. Peptic ulcer bleeding was the most common cause with an incidence of 1.8/100,000 person-years and this was almost similar to previously reported peptic ulcer perforation of 1.5/100,000 person-years.[8] Elderly in this population were more susceptible to non-variceal bleeding, especially from DUs and had a higher risk score and concomitant co-morbidities, in keeping with recent observation in *H. pylori*-eradicated populations.[12]

Rockall score > 5 may be useful in predicting recurrent bleeding in our population but the AUC suggests that it may be less accurate and we did not assess other thresholds, which was a limitation. Our study shared similar baseline characteristics with Vreeburg et al.[13] including definition for mortality but our results suggest a better prediction of recurrent bleeding rather than in-hospital death. A higher rate of recurrent bleeding observed in our population as compared to in-hospital mortality might explain this discrepancy. The low hemoglobin and urea levels indicated a minor bleeding risk in general, compatible with the overall low risk score observed in this population. The generally low risk score in this population does not, however, allow one to decide for the need of therapeutic endoscopy. Blatchford score may have been more useful in this regard.[14]

Among the variables described in Rockall score, SRH stood out as the most predictive of high risk and in-hospital mortality. The presence of SRH was of greater significance in *H. pylori*-associated bleeding GUs than DUs.[15] In our study population, more than half of upper GI bleeding was a result of GUs with only 20% due to DUs. However, GUs were more likely Forrest III lesions (57.2%) but had relatively benign outcomes. In contrast, DUs, while less common, and were more likely Forrest I and II lesions, but there was significant associations between DUs with all studied outcomes. Previous studies have also similarly observed that *H. pylori*-negative DUs are more likely to bleed and are more common among the elderly population with risk factors.[16,17] These studies were limited by false negative results for *H. pylori*, but our study population does not suffer from this limitation.[16]

Septicaemia, while not a variable in the Rockall score, was also highly predictive of high risk and in-hospital mortality, similarly reported by Zimmerman and others.[18,19] In the original Rockall validation study, pneumonia, which was associated with septicaemia was included in the model but not in the complete model.[9] Our study suggests that septicaemia, if present, should be considered as a major co-morbidity and be given a score of 2. An elevated creatinine was predictive for risk of recurrent bleeding in the multivariable analysis similarly reported by

Zuckerman and others[20,21] Ischemic heart disease, the most common co-morbidity with substantial mortality for GI bleeding also frequently have renal impairment.[22]

Non-variceal upper GI bleeding was associated with more adverse outcomes in the current study with a mostly elderly population, and an almost absence of *H. pylori* infection, and in the presence of offending agents including aspirin, NSAIDs and warfarin. In a study from Japan, the usage of aspirin and NSAIDs was not associated with a serious outcome in GU bleeding[23] but the role of *H. pylori* infection was not addressed. Recent studies found that patients with *H. pylori*-negative peptic ulcers and who took aspirin were more likely to have a higher bleeding risk.[24-26] A recent population-based study implicates warfarin, aspirin and NSAIDs in combination as important aetiologies for upper GI bleeding.[27] Further studies are needed to determine the significance of this finding since this also implicates *H. pylori*-eradicated populations over the long term.

Endoscopic intervention was carried out in only a third of patients with high risk score and this again implies that Rockall score is not useful to select those requiring interventions. Endoscopic therapy with adrenaline only was associated with four-fold risk for recurrent bleeding and approximately ten-fold risk for surgical intervention in the multivariable analysis similarly reported by Levin et al.[28] This indicates that adrenaline alone is unlikely to be sufficient when endoscopic intervention is needed.[29,30]

The need for surgery is not an outcome initially included during the validation study of Rockall score, however surgical intervention is frequently sought in the setting of failed endoscopic therapy. In the current study, the need for surgical intervention of 4.0% was relatively similar to the rate of in-hospital mortality of 3.6%. Previous study indicates an overall mortality of 34.1% in patients with upper GI bleeding requiring surgery.[31] Epigastric pain, predictive of the need of surgery, might be a sign of impending perforation, and should be sought especially in this rural-majority population who often present late in their course of disease.

Some limitations should be mentioned. We might not have captured all patients with upper GI bleeding especially the more rural population. However, our hospital is the largest referral institution within the region and we have a reliable GI registry. On the other hand, the current study allowed us to understand the behaviour of non-variceal upper GI bleeding in an environment not influenced by *H. pylori*, a confounder that affect most if not all the populations in Asia.

So what the future would be like for non-variceal upper GI bleeding in the absence of *H. pylori*? We can conclude that in our population with an exceptional low prevalence of *H. pylori*

infection and also peptic ulcer disease, acute non-variceal upper GI bleeding was also of low incidence, similar to its peptic ulcer perforation rates. An absence of *H. pylori* infection may not however reduce the risk of peptic ulcer bleeding in the presence of risk factors especially offending drugs in an elderly population.

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LEGEND:

Figure 1: The usefulness of Rockall score in predicting outcomes in non-variceal upper gastrointestinal bleeding in this ethnic Malay-majority population

Table 1 (on next page)

Clinical characteristics of study population

n; frequency, SEM; standard error of mean, # significant P value < 0.05 (Fisher's exact or Pearson Chi-Square test for categorical and t-test for continuous variables)

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Table 1: Clinical characteristics of study population

Parameters	All	High risk	Mortality	Recurrent bleeding	Need for surgery
Age, years, mean (SEM)	62.1 (1.0)	68.5 (2.6)#	60.5 (7.4)	60.5 (3.4)	62.4 (4.5)
Gender, n (%)					
Male	144 (57.6)	20 (8.0)	5 (2.0)	17 (6.8)	8 (3.2)
Female	106 (42.4)	17 (6.8)	4 (1.6)	7 (2.8)	3 (1.2)
Ethnic, n (%)					
Malays	209 (83.6)	31 (12.4)	7 (2.8)	22 (8.8)	11 (100)
Non-Malays	41 (16.4)	6 (2.4)	2 (0.8)	2 (0.8)	0
Causative lesions, n (%)					
Peptic Ulcer	204 (81.6)	32 (12.8)	9 (3.6)	24 (9.6)#	10 (4.0)
Gastric ulcer	135 (54.0)	15 (6.0)	3 (1.2)	10 (4.0)	4 (1.6)
Duodenal ulcer	49 (19.6)	17 (6.8)#	6 (2.4)#	14 (5.6)#	6 (2.4)#
Gastroduodenal ulcers/erosions	20 (8.0)	0	0	0	0
Gastroduodenitis	36 (14.4)	4 (1.6)	0	0	0
Others (tumours, telangiectasia)	10 (4.0)	1 (0.4)	0	0	0
Presenting symptoms, n (%)					
Melaena	189 (75.6)	32 (12.8)	6 (2.4)	22 (8.8)	11 (4.4)
Haematemesis	117 (46.8)	16 (6.4)	4 (1.6)	9 (3.6)	3 (1.2)
Epigastric pain	103 (41.2)	16 (6.4)	2 (0.8)	11 (4.4)	9 (3.6)#
Anaemia	168 (67.2)	30 (12.0)#	8 (3.2)	23 (9.2)#	11 (4.4)#
Laboratory parameters, mean (SEM)					
Hemoglobin (g/dl)	8.2 (0.2)	7.3 (0.4)#	6.5 (0.7)#	6.7 (0.3)#	6.3 (0.4)#
Platelet (x 10^3/mm^3)	292.3 (10.4)	261.9 (25.3)	248.9 (43.1)	339.7 (50.4)	375 (51.4)
INR	1.3 (0.05)	1.4 (0.1)	2.0 (0.4)	1.4 (0.1)	1.3 (0.1)
aPTT (seconds)	33.9 (0.8)	37.9 (1.6)#	39.9 (4.2)	38.8 (3.3)	35.4 (2.2)
Urea (mmol/l)	14.1 (0.8)	18.3 (2.4)	22.5 (4.5)#	21.0 (3.2)#	20.3 (4.4)
Creatinine (mmol/l)	170.9 (13.6)	196.3 (35.1)	316.9 (96.4)	290.4 (54.4)#	217.8 (54.1)

Legend: n; frequency, SEM; standard error of mean, # significant *P* value < 0.05 (Fisher's exact or Pearson Chi-Square test for categorical and t-test for continuous variables)

Table 2(on next page)

Co-morbidities and risk factors

n; frequency, # significant P value <0.05 (Fisher's exact test or Pearson Chi-Square test for categorical and t-test for continuous variables)

Table 2: Co-morbidities and risk factors

Parameters	All	High risk	Mortality	Recurrent bleeding	Need for surgery
Co-morbidities, n (%)					
Ischemic heart disease	53 (21.2)	14 (5.6)#	2 (0.8)	1 (0.4)	0
Chronic renal failure	41 (16.4)	12 (4.8)#	2 (0.8)	7 (2.8)	3 (1.2)
Chronic liver disease	11 (4.4)	4 (1.6)#	2 (0.8)#	3 (1.2)#	1 (0.4)
Diabetes Mellitus	59 (23.6)	11 (4.4)	4 (1.6)	8 (3.2)	3 (1.2)
Malignancies	17 (6.8)	1 (0.4)	4 (1.6)	4 (1.6)	1 (0.4)
Septicaemia	12 (4.8)	6 (2.4)#	4 (1.6)#	4 (1.6)#	1 (0.4)
Risk factors, n (%)					
Previous peptic ulcer disease	41 (16.4)	11 (4.4)#	1 (0.4)	6 (2.4)	2 (0.8)
NSAIDs	85 (34.0)	12 (4.8)	3 (1.2)	11 (4.4)	5 (2.0)
Aspirin	57 (22.8)	9 (3.6)	2 (0.8)	1 (0.4)#	0
Clopidogrel	23 (9.2)	6 (2.4)	1 (0.4)	0	0
Warfarin	13 (5.2)	4 (1.6)	2 (0.8)#	0	0
Corticosteroids	10 (4.0)	1 (0.4)	0	2 (0.8)	1 (0.4)
Herbs/traditional medicine	4 (1.6)	2 (0.8)	0	0	0

Legend: n; frequency, # significant *P* value <0.05 (Fisher's exact test or Pearson Chi-Square test for categorical and t-test for continuous variables)

Table 3(on next page)

Endoscopic features and treatment given

n; frequency, # significant P value <0.05 (Fisher's exact test or Pearson Chi-Square test for categorical and t-test for continuous variables)

Table 3: Endoscopic features and treatment given

Parameters	All	High risk	Mortality	Recurrent bleeding	Need for surgery
Stigmata of recent haemorrhage, n (%)					
None or dark spots	185 (74.0)	9 (3.6)	2 (0.8)	10 (4.0)	3 (1.2)
Major stigmata	65 (26.0)	28 (11.2)#	7 (2.8)#	14 (6.4)#	7 (2.8)#
Forrest classification, n (%)					
Forrest I (a: spurting, b: oozing)	26 (10.4)	13 (5.2)#	5 (2.0)#	11 (4.4)#	6 (2.4)#
Gastric ulcer	9 (3.6)	3 (1.2)	1 (0.4)	3 (1.2)	3 (1.2)
Duodenal ulcer	17 (6.8)	10 (4.0)#	4 (1.6)#	8 (3.2)#	3 (1.2)#
Forrest II (a: vessel, b: clot, c: haematin)	35 (14.0)	13 (5.2)#	1 (0.4)	3 (1.2)	2 (0.8)
Gastric ulcer	24 (9.6)	8 (3.2)#	0	2 (0.8)	1 (0.4)
Duodenal ulcer	11 (4.4)	5 (2.0)#	1 (0.4)	1 (0.4)	1 (0.4)
Gastroduodenal ulcers	1 (0.4)	0	0	0	0
Forrest III (clean base)	143 (57.2)	2 (0.8)	1 (0.4)	5 (2.0)	2 (0.8)
Gastric ulcer	103 (41.2)	4 (1.6)#	2 (0.8)	5 (2.0)	0
Duodenal ulcer	21 (8.4)	2 (0.8)	1 (0.4)	5 (2.0)#	2 (0.8)
Gastroduodenal ulcers	19 (7.6)	0	0	0	0
Type of PPI, n (%)					
Omeprazole	42 (16.8)	6 (2.4)	0	2 (0.8)	0
Pantoprazole	208 (83.2)	31 (12.4)	9 (3.6)	22 (8.8)	10 (4.0)
Tranfusion requirement, n (%)					
Yes	190 (76.0)	32 (12.8)	9 (3.6)	24 (9.6)#	10 (4.0)
No	60 (24.0)	5 (2.0)	0	0	0
Endoscopic intervention, n (%)					
Adrenaline only	43 (17.2)	14 (5.6)#	4 (1.6)	12 (4.8)#	7 (2.8)#
+ coagulation	33 (13.2)	7 (2.8)	2 (0.8)	7 (2.8)#	5 (2.0)#
+ clip	20 (8.0)	10 (4.0)#	0	8 (3.2)#	4 (1.6)#

Legend: n; frequency, # significant *P* value <0.05 (Fisher's exact test or Pearson Chi-Square test for categorical and t-test for continuous variables)

Table 4(on next page)

Results of multiple logistic regression analysis (forward: LR)

LR; likelihood ratio, OR; adjusted odd ratio, CI; confidence interval

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Table 4: Results of multiple logistic regression analysis (forward: LR)

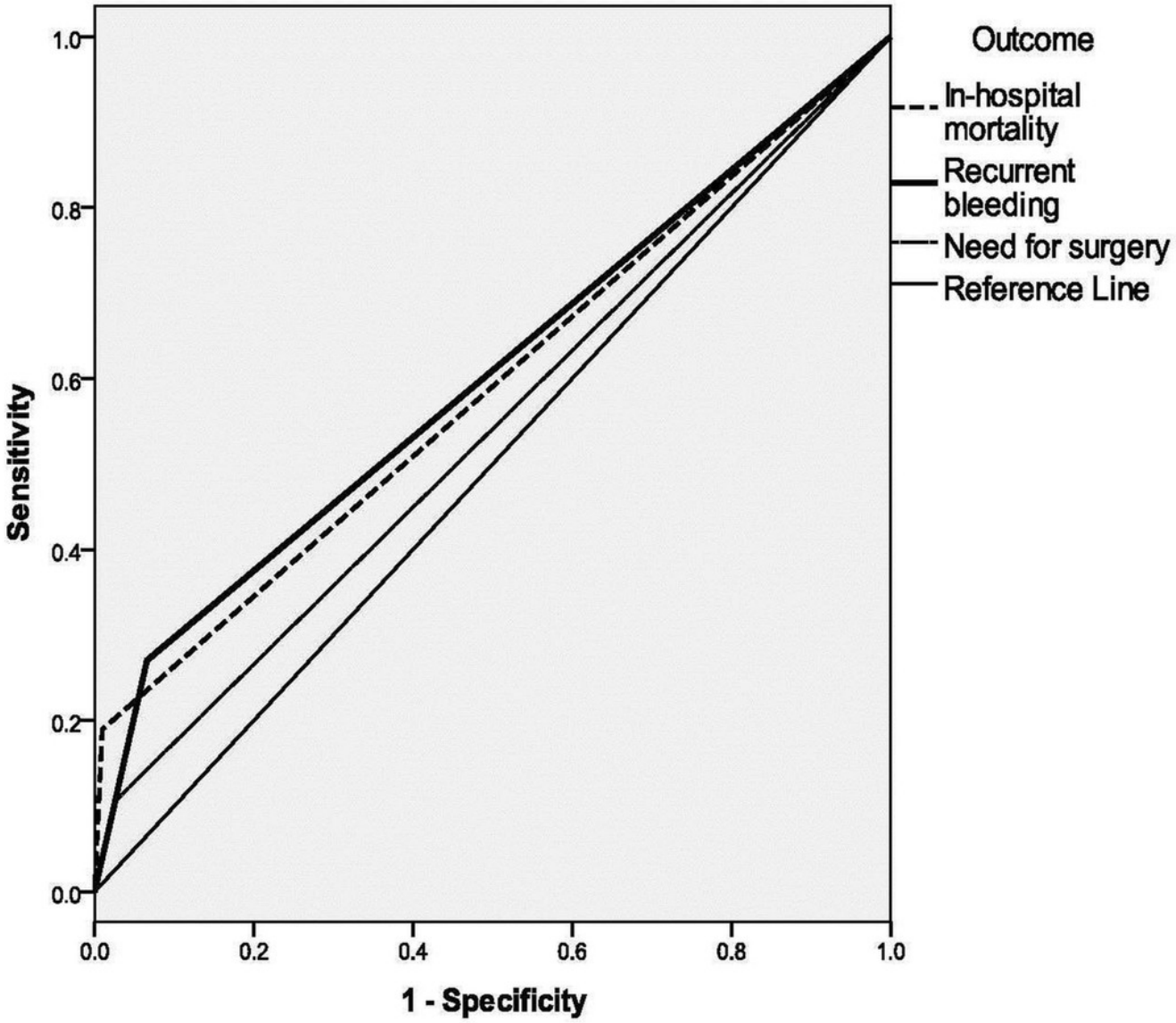
Outcome and risk factors	OR	95% CI for OR	*P* value
High risk			
Major stigmata of bleeding	25.2	8.5 – 74.3	< 0.001
Septicaemia	15.4	2.9 – 81.1	0.001
Chronic renal failure	4.1	1.3 – 12.6	0.01
Ischemic heart disease	3.4	1.2 – 9.7	0.02
Age	1.05	1.0 – 1.1	0.004
In-hospital mortality			
Septicaemia	27.1	4.5 – 162.8	< 0.001
Warfarin	16.7	2.1 – 132.5	0.008
Major stigmata of bleeding	11.0	1.9 – 62.1	0.007
Recurrent bleeding			
Adrenaline only	4.4	1.5 – 12.7	0.006
Creatinine	1.002	1.0 – 1.004	0.04
Need for surgery			
Adrenaline only	9.8	2.3 – 41.9	0.002
Epigastric pain	6.3	1.2 – 32.2	0.03

Legend: LR; likelihood ratio, OR; adjusted odd ratio, CI; confidence interval

Figure 1

Figure 1

The usefulness of Rockall score in predicting outcomes in non-variceal upper gastrointestinal bleeding in this ethnic Malay-majority population



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