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ORIGINAL ARTICLE

Are non-ST-segment elevation myocardial infarctions missing in China?

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Abstract

Aims- ST-segment elevation myocardial infarctions (STEMI) in China and other low- and middle-income countries outnumber non-ST-segment elevation myocardial infarctions (NSTEMI). We hypothesized that the STEMI predominance was associated with lower biomarker use and would vary with hospital characteristics.

Methods and Results- We hypothesized that the STEMI predominance was associated with lower biomarker use and would vary with hospital characteristics. Using data from the nationally representative China PEACE-Retrospective AMI Study during 2001, 2006, and 2011, we compared hospital NSTEMI proportion across categories of use of any cardiac biomarker (CK, CK-MB, or troponin) and troponin, as well as across region, location, level, and teaching status. Among 15 416 acute myocardial infarction (AMI) patients, 14% had NSTEMI. NSTEMI patients were older, more likely female, and to have comorbidities. Median hospital NSTEMI proportion in each study year was similar across categories of any cardiac biomarker use, troponin, region, location, level, and teaching status. For instance, in 2011 the NSTEMI proportion at hospitals without troponin testing was 11.2% [inter quartile range (IQR) 4.4–16.7%], similar to those with >_ 75% troponin use (13.0% [IQR 8.7–23.7%]) (P-value for difference 0.77). Analysed as continuous variables there was no relationship between hospital NSTEMI proportion and proportion biomarker use. With troponin use there was no relationship in 2001 and 2006, but a modest correlation in 2011 (R = 0.16, P = 0.043). Admissions for NSTEMI increased from 0.3/100 000 people in 2001 to 3.3/100 000 people in 2011 (P-value for trend <0.001).

Conclusion- STEMI is the dominant presentation of AMI in China, but the proportion of NSTEMI is increasing. Biomarker use and hospital characteristics did not account for the low NSTEMI rate.

Table 1. Baseline characteristics of non-ST-segment elevation myocardial infarction vs. ST-segment elevation myocardial infarction patients

	NSTEMI (*N* = 2160)		STEMI (*N* = 13 256)	
	#	%	#	%
Demographics				
Age: mean (SD)	67.90	12.13	64.46	12.55
Female	860	39.81	3889	29.34
Medical history				
Angina or coronary heart disease	706	32.69	2768	20.88
Prior myocardial infarction	283	13.10	1351	10.19
Heart failure	101	4.68	175	1.32
Smoking	566	26.20	4530	34.17
Hypertension	1330	61.57	6255	47.19
Diabetes mellitus	550	25.46	2129	16.06
Dyslipidaemia	162	7.50	555	4.19
Prior stroke	293	13.56	1473	11.11
Chronic lung disease	132	6.11	568	4.28
On any home medications	688	31.85	2764	20.85
Admission characteristics				
Chest discomfort	1862	86.20	12223	92.21
Hours from symptom onset to hospitalization				
<3	314	14.54	2668	20.13
≤3 to < 15	591	27.36	4263	32.16
≤15 to < 72	521	24.12	2651	20.00
≥72	734	33.98	3674	27.72
Heart failure on presentation	1113	51.5	5669	42.8
Cardiogenic shock on presentation	780	3.70	810	6.11
Physical examination on admission				
HR categories				
HR<60	231	10.69	1741	13.13
60 ≤ HR ≤ 90	1358	62.87	8520	64.27
HR >90	571	26.44	2995	22.59
SBP categories				
SBP < 100	167	7.73	1627	12.27
100 ≤ SBP ≤ 160	1651	76.44	10323	77.87
SBP > 160	342	15.83	1306	9.85

All P-value for difference < 0.001.
SD, standard deviation; HR, heart rate; SBP, systolic blood pressure; STEMI, ST-segment elevation myocardial infarction; NSTEMI, non-STEMI.

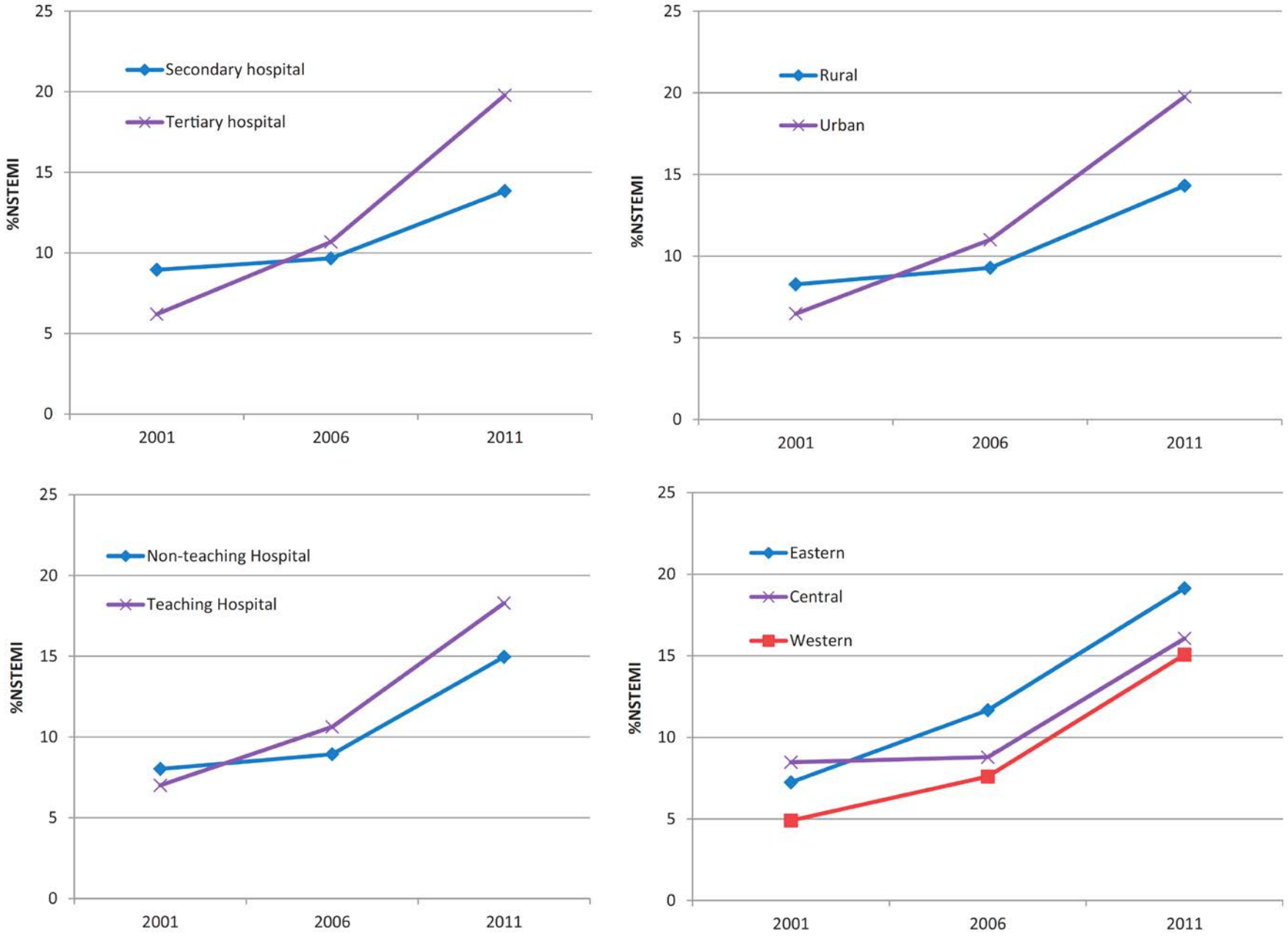
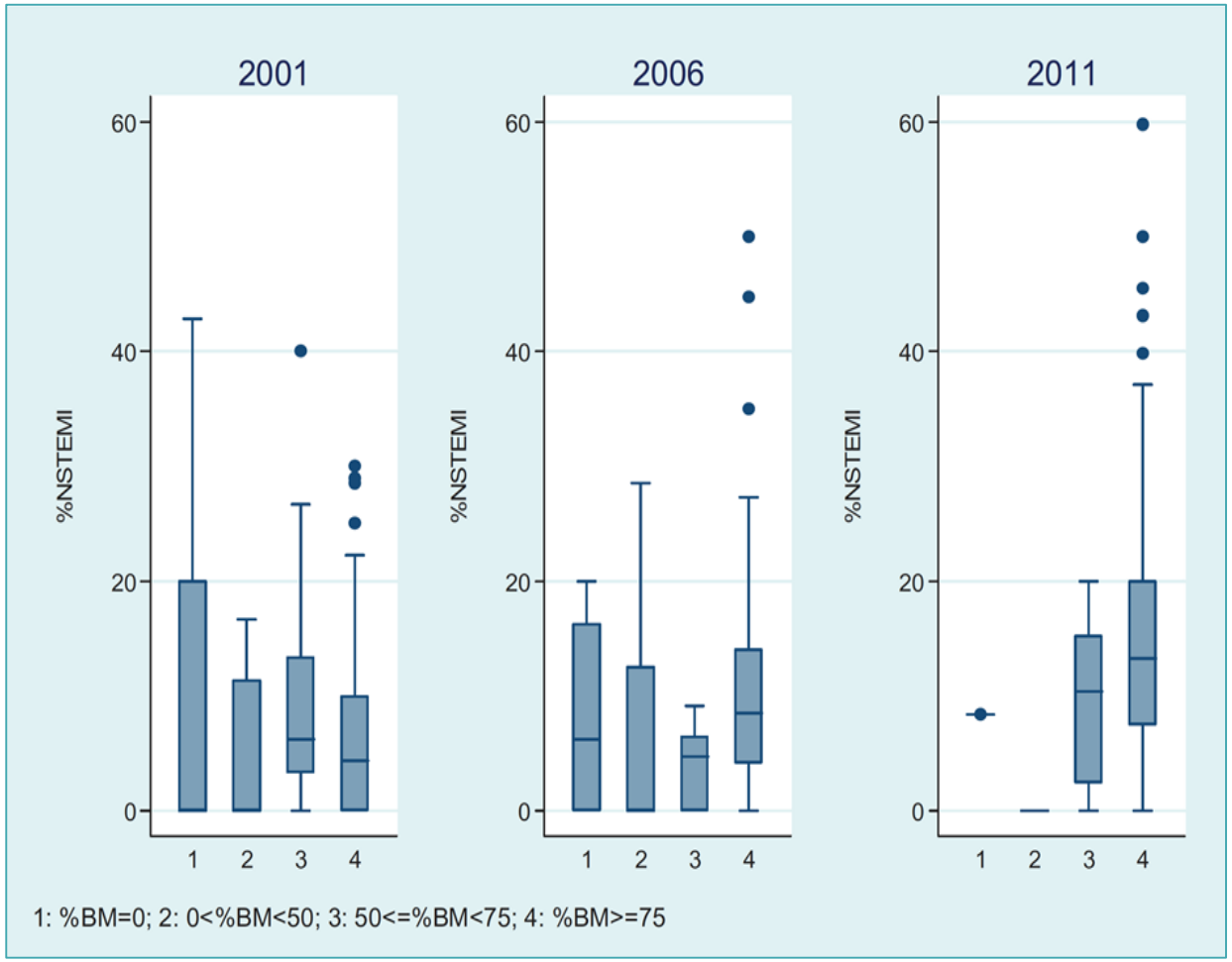


Figure 1. Proportion of NSTEMI at a patient level across sub groups of hospital level, location, teaching status, and region in 2001, 2006, and 2011.



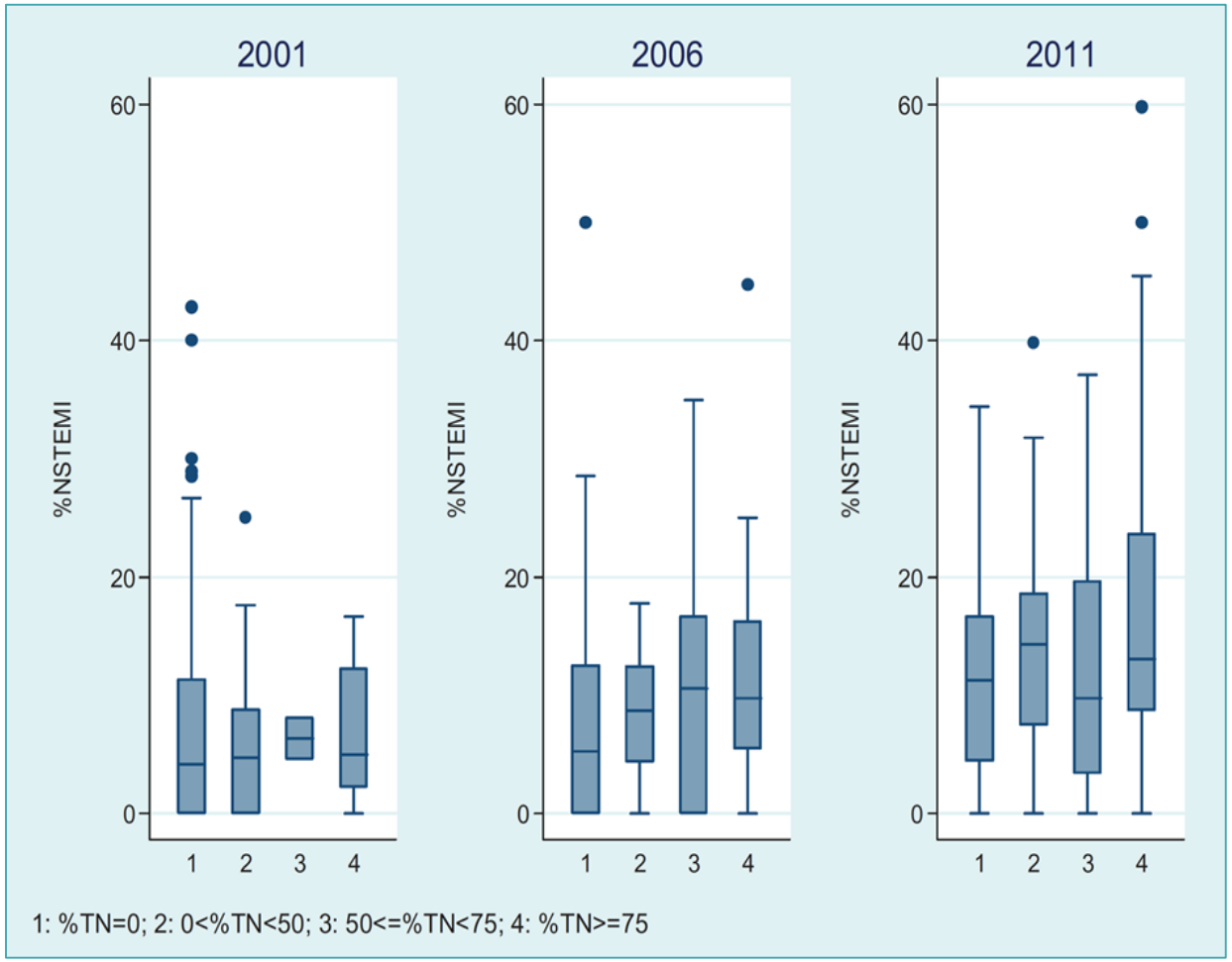


Figure 2. Box and whisker plot showing the distribution of the proportion of NSTEMI across hospitals by sub groups of proportion biomarker and troponin use in 2001, 2006, and 2011. TN, troponin; BM, any biomarker.

Table 2. Median (inter quartile range) proportion of NSTEMI at a hospital level stratified by use of troponin and any biomarker

		%TN = 0	0 < %TN < 50	50 ≤ %TN < 75	%TN ≥ 75
2001	*N*	63	16	2	13
	% (IQR)	4.2(0.0–11.4)	4.7(0.0–8.8)	6.3(4.5–8.1)	5.0(2.3–12.2)
2006	*N*	49	31	14	42
	% (IQR)	5.3(0.0–12.5)	9.1(4.2–13.2)	10.6(0.0–16.7)	9.8(5.6–16.2)
2011	*N*	28	32	19	75
	% (IQR)	11.2(4.4–16.7)	14.3(7.5–18.6)	9.8(3.4–19.6)	13.0(8.7–23.7)
		%BM=0	0 < %BM < 50	50 ≤ %BM < 75	%BM ≥75
2001	*N*	6	7	9	72
	% (IQR)	0.0(0.0–20.0)	0.0(0.0–11.4)	6.3(3.3–13.3)	4.3(0–9.9)
2006	*N*	4	5	8	116
	% (IQR)	6.3(0.0–16.3)	0.0(0.0–12.5)	4.7(0.0–6.5)	8.5(4.1–14.0)
2011	*N*	1	1	8	144
	% (IQR)	8.3(NA)	0.0(NA)	10.4(2.5–15.2)	13.2(7.6–20.0)

All *P*-value for difference > 0.05.
N, number of hospitals; %, median % NSTEMI; IQR, inter quartile range; TN, troponin; BM, any biomarker.

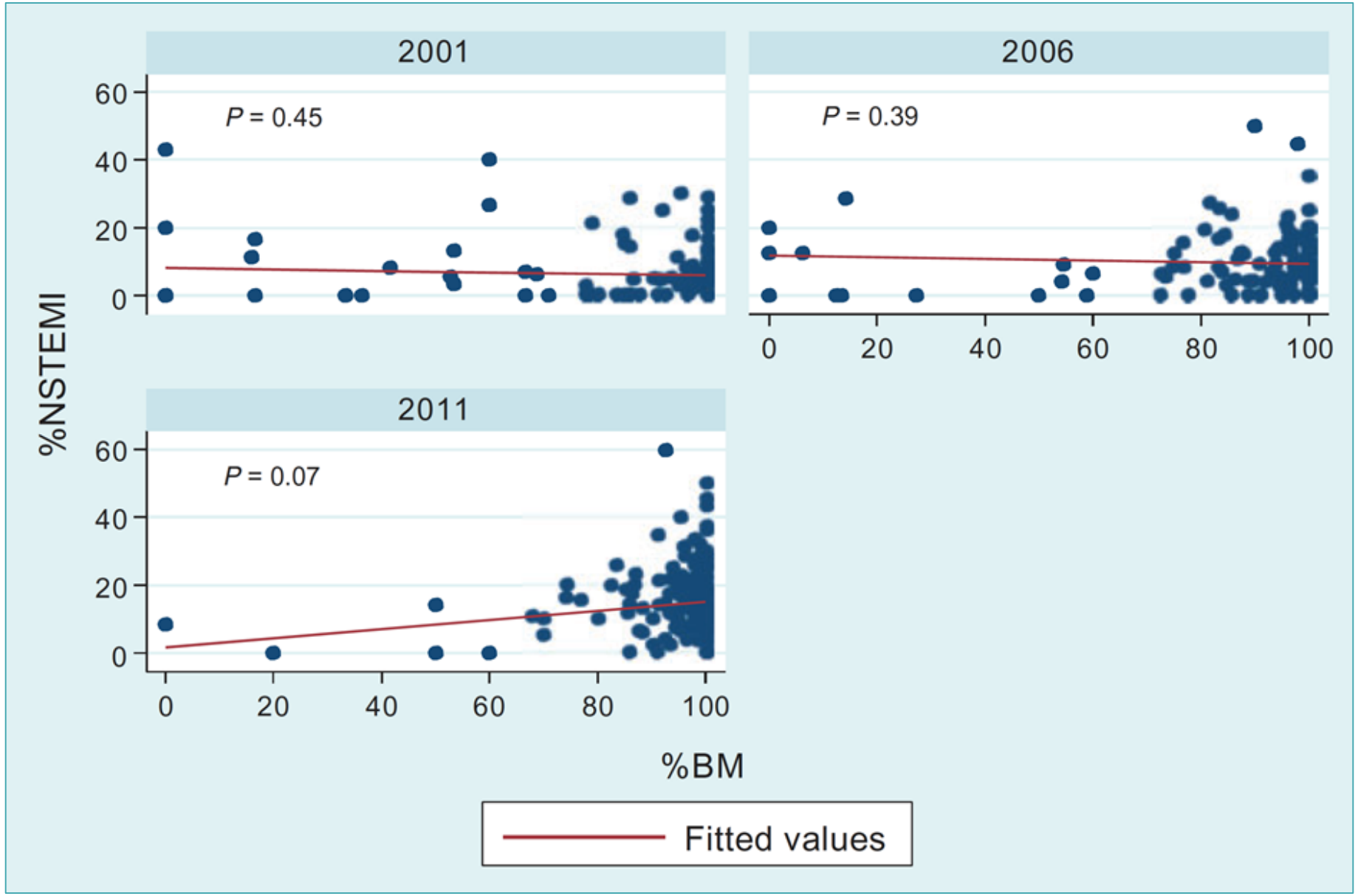


Figure 3. Scatter plot showing relationship between NSTEMI proportion at each hospital with the proportion of biomarker use and troponin use in 2001, 2006, and 2011. BM, any biomarker.

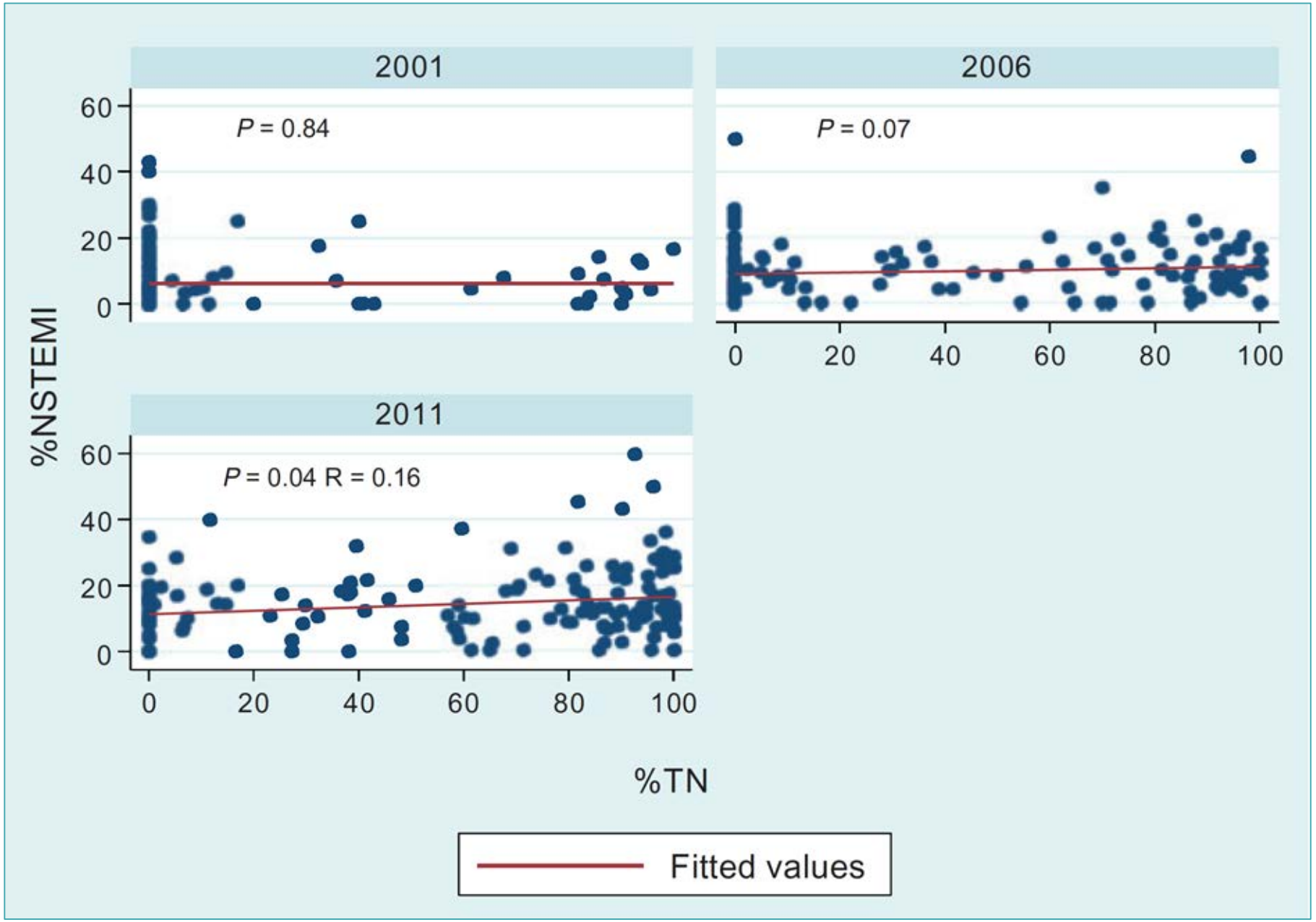


Figure 4. Scatter plot showing relationship between NSTEMI proportion at each hospital with the proportion of troponin use in 2001, 2006, and 2011. TN, troponin.

Table 3. Median (inter quartile range) proportion of non-ST-segment elevation myocardial infarction at a hospital level stratified by hospital characteristics

		Total	Hospital level		Location	
			Secondary	Tertiary	Rural	Urban
2001	*N*	94	44	50	47	47
	% (IQR)	4.3(0.0–11.1)	4.3(0.0–15.0)	4.4(0.0–8.1)	4.3(0.0–13.3)	4.5(0.0–8.3)
2006	*N*	133	71	62	75	58
	% (IQR)	8.3(3.7–13.3)	8.3(0.0–12.9)	8.3(4.2–14.1)	7.5(0.0–12.9)	8.7(4.5–14.1)
2011	*N*	154	90	64	92	62
	% (IQR)	13.0(7.5–20.0)	10.9(5.0–17.9)	16.6(10.5–25.6)[a]	10.9(5.6–17.6)	16.8(10.5–25.6)[a]
		Teaching status		**Region**		
		Non-teaching	Teaching	Eastern	Central	Western
2001	*N*	21	73	51	22	21
	% (IQR)	2.2(0.0–16.7)	4.3(0.0–8.8)	5.0(2.2–12.2)	0.0(0.0–11.4)	0.0(0.0–5.0)
2006	*N*	44	89	58	39	36
	% (IQR)	7.7(0.0–13.2)	8.3(4.2–13.3)	10(4.2–14.3)	5.6(0.0–12.5)	7.5(0.0–10.6)
2011	*N*	59	95	62	48	44
	% (IQR)	10.8(3.8–17.9)	14.3(8.7–22.5)	16.0(10.0–23.7)	12.9(7.1–19.0)	10.2(3.2–18.7)

N, number of hospitals; %, median % NSTEMI; IQR, inter quartile range.
[a]*P* for difference < 0.05.

Conclusion

- STEMI is the dominant presentation of AMI in China. We found little evidence that variable biomarker use accounted for this pattern. This suggests that the low proportion of NSTEMI compared to the West may reflect differences in epidemiology rather than only diagnostic tendencies.
- Focusing on systems of care for STEMI may have an immediate health impact. However, NSTEMI numbers are increasing in China as well and will likely continue to over the next decade, and going forward there is a need to improve screening practices for AMI and standardize approaches.