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for MNM. We used the presence or absence of MNM as the dependent variable, and the variables assessed significantly in univariate analysis were entered as independent variables in multivariate logistic regression analysis.

Statistical analyses were performed using SPSS 18.0 (IBM Corp., NY, USA).

Results

Basic information on surveillance data

Our study included 780359 women with 731185 live births, a total of 2461 MNMs, and 52 maternal deaths were identified. e MNM ratio was 3.37‰ (95%CI: 3.23–3.50), and the maternal mortality was 7.11 per 100000 live births (95%CI: 5.18–9.04). Table 1 shows the details of basic information on surveillance data and MNM ratios by year (Fig. 1; Table 1).

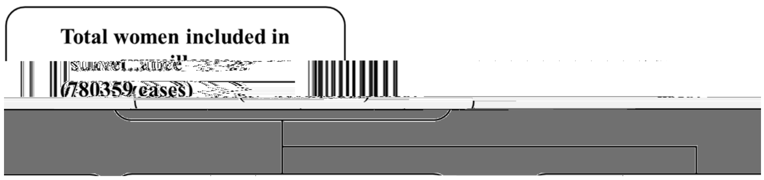

Fig. 1 Basic information on surveillance data in Hunan Province, China, 2012-2022

Table 1 Basic information on surveillance data in Hunan Province, China, 2012–2022

Year	All women (*n*)	Live births (*n*)	Women with pregnancy complications (*n*, %)	Women with life-threatening conditions (*n*, %)	MNM (*n*, %)	MNM ratio (‰, 95%CI)	Maternal death (*n*)	Maternal mortality (per 100000, 95%CI)
2012	62,608	62,150	9267 (14.80)	184 (0.29)	175 (0.28)	2.82(2.40–3.23)	9	14.48(5.02–23.94)
2013	67,886	66,035	23,243 (34.24)	255 (0.38)	246 (0.360 -1.125 Td	[illegible]		

67,886 66,0355Tj 6.683 0 Td (279,55)Tj 6.24)

Abbreviations: *MNM* maternal near-miss, *CI* con dence intervals

Causes of MNM

Coagulation/hematological dysfunction was the most common cause of MNM (75.66%), followed by cardiovascular dysfunction (23.41%). From 2012 to 2022, the proportion of coagulation/hematological dysfunction among MNM showed an increased trend from 49.14% in 2012 to 86.39% in 2022, while cardiovascular dysfunction (from 28.00% in 2012 to 16.57% in 2022), respiratory dysfunction (from 11.43% in 2012 to 3.55% in 2022), renal dysfunction (from 4.57% in 2012 to 1.78% in 2022), neurological dysfunction (from 29.14% in 2012 to 4.14% in 2022), and uterine dysfunction (from 21.71% in 2012 to 2.96% in 2022) showed decreased trends ($P < 0.05$). ere was no significant trend in hepatic dysfunction ($P > 0.05$). Table 2 shows the details of causes of MNM by year (Table 2).

Results of univariate analysis and multivariate logistic regression analysis for pregnancy complications associated with MNM

In the univariate analysis, all pregnancy complications

Table 2 Causes of MNM in Hunan Province, China, 2012–2022

Variables	Total (*n*, %)	2012 (*n*, %)	2013 (*n*, %)	2014 (*n*, %)	2015 (*n*, %)	2016 (*n*, %)	2017 (*n*, %)	2018 (*n*, %)	2019 (*n*, %)	2020 (*n*, %)	2021 (*n*, %)	2022 (*n*, %)	χ^2_{trend}	*P*
MNM	2461	175	246	245										

Table 2 (continued)

Table 2 (continued)

Variables	Total (*n*, %)	2012 (*n*, %)	2013 (*n*, %)	2014 (*n*, %)	2015 (*n*, %)	2016 (*n*, %)	2017 (*n*, %)	2018 (*n*, %)	2019 (*n*, %)	2020 (*n*, %)	2021 (*n*, %)	2022 (*n*, %)	χ^2_{trend}	*P*(*n*, %)

On the one hand, most previous studies did not conduct multivariate analysis, which may have confounding results. On the other hand, diabetes mellitus may be primarily associated with other pregnancy complications [30

In addition, we obtained the aOR for each pregnancy complication associated with MNM through multivariate analysis. eoretically, a larger aOR value indicates that a higher proportion of pregnancy complications occurred in the case group than in the control group. Conversely, we can approximately consider that the higher the aOR for a pregnancy complication, the greater the likelihood that a pregnant woman will develop MNM if she has that pregnancy complication.

ese findings have important implications for clinical counseling and public health policies. For example, for pregnant women with high-risk pregnancy complications, doctors should convince them to receive treatment to avoid MNM; the government can implement public health programs to screen pregnant women who are at high risk of MNM, and provide free treatment to reduce the incidence and economic burden of MNM.

is study could improve some things. First, the associations between pregnancy complications and MNM showed only correlations and may not be causal. Further in-depth studies are needed. Second, there may be the risk of under-reporting MNMs in the surveillance system, especially at some county-level surveillance sites.

Conclusion

e MNM ratio was relatively low in Hunan Province. Several pregnancy complications increased the risk of MNM. It is helpful for clinical counseling and public health policies, which may contribute to preventing MNM.

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Authors' contributions