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Profile of colorectal polyps in young patients
A retrospective study

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Abstract

There is an increased incidence of colorectal cancer in young patients, however, the relationship between polyp characteristics and histology is not clearly understood. This study aimed to investigate the prevalence of different histological types of polyps in young patients and risk factors associated with advanced histology. Young patients (aged <45) who underwent polypectomy at Sir Run Run Shaw Hospital (2015–2017, Zhejiang, China) and West China Xiamen Hospital (2023–2024, Xiamen, China) were included. A database of endoscopes was accessed to classify polyps according to endoscopic features. The distribution of polyps and the risk factors associated with advanced histology were reported. The detection rate of polyps among the young adults was 20%, with 47.6% of adenoma. Hyperplastic polyps were second only to tubular adenomas in frequency. Of the 2776 polyps, nearly 85% were sessile, 29.4% were located in the sigmoid colon, and 25.4% were located in the rectum. Among polyps, 87.3% were <10 mm in diameter. Histological features of advanced adenoma were found in 5.3% of patients. Of these, 30.4% occurred in polyps <10 mm. Furthermore, 69.6% were distributed in the distal colorectum. Multivariate logistic regression analysis demonstrated that polyp size and morphology were independent predictors of advanced adenomas. In young patients, polyps are mainly located in the distal colorectum, with tubular adenoma being the predominant type. Large size and pedunculated morphology were independent predictors of advanced polyp histology in young patients. Nearly one-third of the advanced histology cases were associated with small polyps. It is recommended that endoscopists resect all neoplastic polyps found during colonoscopy, especially pedunculated polyps, and submit them for histology.

Abbreviations: ADR = adenoma detection rate, CRC = colorectal cancer, OR = odds ratio, SRRSH = Sir Run Run Shaw Hospital, SSA/P = sessile serrated adenoma/polyp, TA = tubular adenoma, TVA = tubulovillous adenoma, VA = villous adenoma, WCXMH = West China Xiamen Hospital.

Keywords: advanced histology, colorectal polyps, young

1. Introduction

The vast majority of colorectal polyps are incidentally detected during colonoscopy. A polyp is defined as a proliferative or neoplastic lesion of the intestinal mucosal layer,[1] increased in detection with the widespread use of colonoscopy. Most lesions were small (<2 cm in diameter). Adenomatous polyps have been reported in approximately one-third of patients undergo colonoscopy.[2] Polyps have become a major clinical problem owing to their high prevalence and tendency for malignant transformation.

A great deal of effort has been done on depicting the clinical and advanced histological aspects of colorectal polyps,[3–6] but the disease spectrum is variable in different populations, and the association between the endoscopic characteristics and histology of colorectal polyps is not fully understood. It has been reported that 5.6% of polyps present with advanced histopathological features.[7] The low prevalence of advanced histopathology for some polyps suggests that not all polyps require endoscopic resection or continuous endoscopic surveillance. Given the increasing incidence of colorectal cancer (CRC) in young patients, it is significant to identify the correlation between polyp characteristics and histopathology in such populations. This study aimed to analyze the prevalence of different types of colorectal polyps in a young cohort utilizing retrospective data and to explore the relationship between the endoscopic characteristics of polyps and histopathology.

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The authors have no conflicts of interest to disclose.

The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

This study was conducted with the approval of the Ethics Committees of Sir Run Run Shaw Hospital, Zhejiang University and West China Xiamen Hospital, Sichuan University.

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Table 1

Distribution frequency of polyps of various histological types by endoscopic parameters.

	Polyp size					Location						Morphology	
n (%)	1–5 mm	6–9 mm	10–19 mm	20–49 mm	≥50 mm	Cecum	Ascending colon	Transverse colon	Descending colon	Sigmoid colon	Rectum	Pedunculate	Sessile
Total	1694	673	275	64	4	242	289	527	318	817	706	412	2364
Others	298	45	19	4	0	36	39	76	44	89	104	33	357
	(17.6)	(6.7)	(6.9)	(6.3)	(0)	(14.9)	(13.5)	(14.4)	(13.9)	(10.9)	(14.7)	(8.0)	(15.1)
IP	142	51	16	3	0	23	22	30	26	42	78	34	185
	(8.4)	(7.6)	(5.8)	(4.7)	(0)	(9.5)	(7.6)	(5.7)	(8.2)	(5.2)	(11.1)	(8.3)	(7.8)
HMP	2	5	8	2	0	1	1	2	1	4	8	13	4
	(0.1)	(0.7)	(2.9)	(3.1)	(0)	(0.4)	(0.3)	(0.4)	(0.3)	(0.5)	(1.1)	(3.1)	(0.2)
HP	589	178	25	4	0	10	64	123	72	246	292	42	765
	(34.8)	(26.5)	(9.1)	(6.3)	(0)	(4.1)	(22.1)	(23.3)	(22.6)	(30.1)	(41.4)	(10.2)	(32.4)
TSA	16	10	6	3	0	1	5	6	4	9	10	5	30
	(0.9)	(1.5)	(2.2)	(4.7)	(0)	(0.4)	(1.7)	(1.1)	(1.3)	(1.1)	(1.4)	(1.2)	(1.3)
TA-LG	631	354	133	18	0	41	134	274	160	365	180	209	945
	(37.2)	(52.6)	(48.3)	(28.1)	(0)	(16.9)	(46.4)	(52.0)	(50.3)	(44.7)	(25.5)	(50.7)	(40.0)
TA-HG	0	5	9	2	1	2	4	1	2	5	2	9	7
	(0)	(0.7)	(3.3)	(3.1)	(25)	(0.8)	(1.4)	(0.2)	(0.6)	(0.6)	(0.3)	(2.2)	(0.3)
TVA	10	16	45	20	1	4	15	10	6	42	19	54	43
	(0.6)	(2.4)	(16.4)	(31.2)	(25)	(1.6)	(5.2)	(1.9)	(1.9)	(5.1)	(2.7)	(13.1)	(1.8)
VA	0	2	6	3	0	0	0	1	1	6	3	4	7
	(0)	(0.3)	(2.2)	(4.7)	(0)	(0)	(0)	(0.2)	(0.3)	(0.7)	(0.4)	(1.0)	(0.3)
SSA/P	6	7	2	2	0	1	4	4	1	6	1	3	13
	(0.4)	(1.0)	(0.7)	(3.1)	(0)	(0.4)	(1.4)	(0.8)	(0.3)	(0.7)	(0.1)	(0.7)	(0.5)
Ca	0	0	6	3	2	0	1	0	1	3	9	6	8
	(0)	(0)	(2.2)	(4.7)	(50)	(0)	(0.4)	(0)	(0.3)	(0.4)	(1.3)	(1.5)	(0.3)

Ca = carcinoma, HMP = hamartomatous polyp, HP = hyperplastic polyp, IP = Inflammatory polyp, SSA/P = sessile serrated adenoma/polyp (SSA/P), TA = tubular adenoma, TA-HG = tubular adenoma with high-grade dysplasia, TSA = traditional serrated adenoma, TVA = tubulovillous adenoma, VA = villous adenoma.

Table 2

Details in demographic and endoscopic parameters and the univariate logistic regression of colorectal adenomas.

				Univariate		
Variables	**Total (n = 1321)**	**Nonadvanced adenomas (n = 1173)**	**Advanced adenomas (n = 148)**	**β**	***P***	**OR (95% CI)**
Age, Mean ± SD	38.3 ± 5.1	38.3 ± 5.0	37.8 ± 5.5	−0.02	.210	0.98 (0.95–1.01)
Gender, n (%)						
Female	435 (32.9)	377 (32.1)	58 (39.2)			1.00 (Reference)
Male	886 (67.1)	796 (67.9)	90 (60.8)	−0.31	.086	0.73 (0.52–1.05)
Polyp location, n (%)						
Distal colorectum	823 (62.3)	720 (61.4)	103 (69.6)			1.00 (Reference)
Proximal colon	498 (37.7)	453 (38.6)	45 (30.4)	−0.36	.053	0.69 (0.48–1.00)
Polyp size, n (%)						
<10 mm	1061 (80.3)	1016 (86.6)	45 (30.4)			1.00 (Reference)
10–19 mm	205 (15.5)	136 (11.6)	69 (46.6)	2.44	<.001	11.45 (7.56–17.36)
≥20 mm	55 (4.2)	21 (1.8)	34 (23.0)	3.60	<.001	36.55 (19.65–67.99)
Polyp morphology, n (%)						
Pedunculated	286 (21.6)	210 (17.9)	76 (51.3)			1.00 (Reference)
Sessile	1035 (78.4)	963 (82.1)	72 (48.7)	−1.58	<.001	0.21 (0.14–0.29)

CI = confidence intervals, OR = odds ratio.

2. Materials and Methods

2.1. Patients

This retrospective study was approved by the Ethics Committees of the Sir Run Run Shaw Hospital (Zhejiang University School of Medicine, SRRSH), and West China Xiamen Hospital (Sichuan University, WCXMH), with informed consent obtained from the patients. The records of young patients (aged 18–44) who underwent endoscopic polypectomy at SRRSH (2015–2017) and WCXMH (2023–2024) were analyzed. Data, including basic demographics, polyp size, location, morphology, endoscopic diagnosis and pathology, were retrieved from electronic medical records. Standard colonoscopy was performed by senior endoscopists. A senior endoscopist was defined by performing more than 3000 examinations with more than 10 years of experience in endoscopic procedures. The pathological types of polyps were evaluated by experienced gastrointestinal pathologist based on the WHO 2019 classification.[8]

2.2. Polyp characteristics

The polyps were graded by size as follows: 1 to 5, 6 to 9, 10 to 19, 20 to 49 mm, and ≥50 mm. The polyps were ranked by location as follows: cecum, ascending colon, transverse colon, descending colon, sigmoid colon, and rectum. The proximal colon was defined as being located from the cecum to the transverse colon, whereas the distal colorectum was classified as being located from the splenic flexure to the rectum. The polyps were stratified by morphology as follows: pedunculated and sessile. Polyps were further stratified by histopathology into inflammatory polyp, hamartomatous polyp，hyperplastic polyp, traditional serrated adenoma, tubular adenoma (TA), tubulovillous adenoma (TVA), villous adenoma (VA), tubular adenoma with high-grade dysplasia, sessile serrated adenoma/polyp (SSA/P), carcinoma, and others (including intestinal mucosa, lymphoid polyps, carcinoid tumors, and neuroendocrine tumors, etc). Any polyp exhibiting histologic features of TVA, VA, tubular adenoma with high-grade dysplasia, SSA/P, or carcinoma is referred to as a "advanced adenoma."

2.3. Statistical analysis

Data processing and analysis were performed using R version 4.4.0, along with Zstats 1.0 (www.zstats.net). Descriptive statistics were performed for all variables, including means and standard deviations for continuous variables, and frequencies for categorical variables. *T* test or chi-square test was used to analyze the differences between variables. Identification of factors influencing advanced adenoma were performed using binary logistic regression analysis. For the multivariate analysis model, only factors with $P < .2$ in the univariate analysis were included. $P < .05$ was considered statistically significant.

3. Results

3.1. Baseline characteristics of the patients and the histological features of colorectal polyps

During the study period, a total of 10,250 young patients (aged 18–44) underwent colonoscopy at both hospitals, among whom 2050 (20%) underwent polypectomy. Finally, 207 patients were excluded because of incomplete pathology or endoscopy reports, and the remaining 1843 young patients (2776 polyps) were included for analysis. Their mean age was 37.6 ± 5.4, with 1249 (67.8%) male. The distribution of different histological types of colorectal polyps was shown in Table 1. A total of 2776 polyps were detected, including 1455 (52.4%) nonneoplastic polyps and 1321 (47.6%) colorectal adenomas (neoplastic polyps). Among the colorectal adenomas, there were 1170 TA, 97 TVA, 11 VA, 16 SSA/P, and 14 carcinomas. Details in demographic and endoscopic parameters and the univariate logistic regression analysis of colorectal adenomas were shown in Table 2. The average age of young patients with colorectal adenomas was 38.3 ± 5.1. There was no significant difference in age ($P = .210$) or gender ($P = .086$) between patients with advanced adenomas and those with nonadvanced adenomas. Among male patients, 90 (10.2%) were advanced adenomas, and the remaining 89.8% were nonadvanced adenomas (8.8-fold difference), compared to 13.3% of female patients with advanced adenomas and 86.7% with nonadvanced adenomas (6.5-fold difference).

3.2. Size of polyps

There were 2776 polyps, of which 2710 had definite sizes. Of the 2710 polyps, 2367 (87.3%) were <10 mm in diameter and 343 (12.7%) were ≥10 mm. Of the 1321 adenomatous polyps, 1061 (80.3%) were <10 mm, 205 (15.5%) were 10 to 19 mm, and 55 (4.2%) were ≥20 mm. TA was the most common polyp type, of which only 64 (5.4%) were ≥20 mm, 142 (11.9%) were 10 to 19 mm and 990 (82.7%) were <10 mm. Conversely, among the 92 TVA and 11 VA, 71.7% and 81.8% were ≥10 mm, respectively. In addition, HP, which was common in polyps <10 mm, occurred second only to TA in frequency. As shown in Table 2,

among the 2776 polyps, 148 polyps (5.3%) harbored histological characteristics of advanced adenoma. Of these, 45 (30.4%) occurred in <10 mm polyps, 69 (46.6%) occurred in 10 to 19 mm polyps, and 34 (23.0%) occurred in ≥20 mm polyps. Adenomas <20 mm, especially those <10 mm, were more likely to be nonadvanced adenomas. However, since most polyps were tiny or small, a significant proportion (30.4%) of all polyps with features of advanced adenoma occurred in polyps <10 mm.

3.3. Location of polyps

Of 2776 polyps, 817 (29.4%) were found in the sigmoid colon, followed by 706 (25.4%) in the rectum. As shown in Table 1, the frequency of advanced adenomas in each part of the colon was 24/289 (8.3%) in the ascending colon, 62/817 (7.6%) in the sigmoid colon, 11/318 (3.5%) in the descending colon, 24/706 (3.4%) in the rectum, 16/527 (3.0%) in the transverse colon, and 7/242 (2.9%) in the cecum. Of the advanced adenomas (n = 148), 45 (30.4%) were distributed in the proximal colon and 103 (69.6%) polyps were distributed in the distal colorectum (Table 2, $P = .053$).

3.4. Morphology of polyps

Of the 2776 polyps, nearly 85% were sessile. Of the 148 advanced adenoma, 76 (51.3%) were pedunculated polyps and 72 (48.7%) were sessile ones. The frequency of advanced adenoma was 76/412 (18.4%) in pedunculated polyps and 72/2364 (3.0%) in sessile ones. As presented in Table 2, the distributions of advanced adenoma and nonadvanced adenoma were different in both morphology groups (pedunculated vs sessile: 51.3% vs 48.7%, 17.9% vs 82.1%, respectively, $P < .001$).

3.5. Risk factors for advanced adenomas

Logistic regression models were performed to explore the potential factors associated with advanced adenomas (Table 2 and Fig. 1). On univariate logistic regression analysis (Table 2), size and morphology of polyps correlated with advanced adenoma ($P < .05$). On multivariate logistic regression analysis (Fig. 1), the size and morphology of polyps were independently correlated with advanced adenoma (compared to <10 mm, 10–19 mm, odds ratios [OR] = 8.99, $P = <.001$; ≥20 mm, OR = 27.12, $P < .001$; sessile, OR = 0.50, $P = .001$). Conversely, no significant differences were observed between the 2 groups regarding age, gender and adenoma location ($P > .05$). Details of the parameters of colorectal adenomas from the 2 hospitals were shown in Table 3.

4. Discussion

The present study, conducted in 2 comprehensive tertiary hospitals, provided a profile of colorectal polyps in young patients. A frequency of advanced adenomas of the colon is approximately 5%, which increases with increasing polyp size. Advanced histology was more prevalent in larger pedunculated colorectal polyps, but nearly one-third of advanced adenomas were discovered in polyps <10 mm.

International guidelines recommend CRC screening in average-risk adults over 45 years of age for early detection of CRC and adenomatous polyps.[9] Recently, physicians have called for increased awareness of CRC in young populations because of the increased incidence of CRC in young populations.[10] The reported prevalence of colonic polyps varies widely, possibly due to differences in the structure of studies, screening methods, and even genetic and environmental factors. Data on the prevalence and distribution of polyps in young Asians are limited. It was estimated that 30% of the Western population suffers from colon polyps, while lower rates (10–15%) have been recorded in Asia and Africa.[11] In our study, the colorectal polyp detection rate is 20% in youth (average age 37.6 ± 5.4), compared with 17.5% in Chinese patients under age 50 (average age 41.0 ± 6.8 years)[12]and 16.3% in the asymptomatic Chinese (average age 56.6 ± 10.7 years).[13] The adenoma detection rate (ADR) has been regarded as a primary benchmark for colonoscopy.[14,15] The predominant type of polyps is adenomatous polyps int our study, the ADR in young patients is approximately 47.6%. It was reported that the prevalence of colorectal adenomas is 3.2% in patients aged 19 to 29 years, 13.8% in those aged 30 to 39 years, and 21.1% in those aged 40 to 49 years.[16] Aging is a risk factor for colorectal adenomas and is associated with the development of high-grade dysplasia in adenomas, irrespective of the size and histology of the adenoma.[17] In the 40 to 49 years and 50 to 59 years groups, Leshno et al noted significant disparities in Western and East Asian

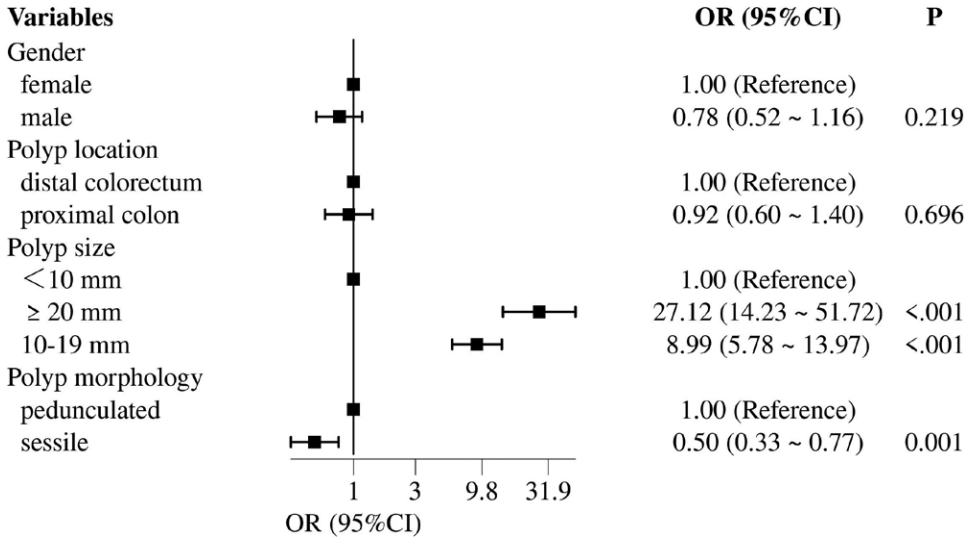

Figure 1. Odds ratio (OR) of risk factors associated with advanced adenomas. Multivariate logistic regression model was adjusted for all variables in the Table 2. OR = odds ratio, CI = confidence intervals.

Table 3

Details of demographic characteristics and endoscopic parameters of colorectal adenomas from 2 hospitals.

Variables	Total (n = 1321)	WCXMH (n = 275)	SRRSH (n = 1046)	Statistic	*P*
Age, Mean ± SD	38.3 ± 5.1	39.0 ± 4.6	38.3 ± 5.2	t = –1.18	.238
Gender, n (%)				χ^2=1.19	.276
Male	886 (67.1)	192 (69.8)	694 (66.4)		
Female	435 (32.9)	83 (30.2)	352 (33.6)		
Polyp location, n (%)				χ^2=15.69	<.001
Proximal colon	498 (37.7)	132 (48.0)	366 (35.0)		
Distal colorectum	823 (62.3)	143 (52.0)	680 (65.0)		
Polyp size, n (%)				χ^2=6.41	.040
<10 mm	1061 (80.3)	228 (82.9)	833 (79.6)		
10–19 mm	205 (15.5)	43 (15.6)	162 (15.5)		
≥20 mm	55 (4.2)	4 (1.5)	51 (4.9)		
Polyp morphology, n (%)				χ^2=40.21	<.001
Sessile	1035 (78.4)	254 (92.4)	781 (74.7)		
Pedunculated	286 (21.6)	21 (7.6)	265 (25.3)		
Adenomas, n (%)				χ^2=1.07	.301
Nonadvanced	1173 (88.8)	249 (90.5)	924 (88.3)		
Advanced	148 (11.2)	26 (9.5)	122 (11.7)		

SD = standard deviation, SRRSH = Sir Run Run Shaw Hospital, T = *t* test, WCXMH = West China Xiamen hospital, χ^2 = Chi-square test.

populations regarding total and advanced ADR.[18] We found a higher ADR in men than in women, and the ratio of ADR in men to women was 2.0 (man vs female, 886 vs 435), which is consistent with other studies in Asian population studies[19–22] (odds ratios ranged from 1.7 to 2.4). Our findings support the conclusion that optimal the ADR targets should be stratified according to gender and age. Although several studies have shown that gender and age are risk factors for advanced adenoma or CRC,[23–27] no such gender associations not found in our youth cohort study.

Clinicians make judgments regarding particular polyps based on histology. The proportion of each polyp type appeared to provide the most visually and clinically meaningful information. Our study and others have shown that the histological features of advanced adenomas become more prevalent as the polyp size increases.[5–7] Martínez et al demonstrated that patients with baseline adenomas of 10 to 19 mm and ≥20 mm have a substantially higher risk of developing advanced neoplasms than those with adenomas of <5 mm (8%, 16%, and 19%, respectively),[28] emphasizing the necessity of excising large polyps. In our study, small polyps had a relatively low proportion of advanced adenomas compared with large polyps (>10 mm). Some small polyps may regress or grow slowly,[29] and overdiagnosis of tiny polyps appears to incease the cost of colonoscopic surveillance. However, since the majority of all polyps were tiny, a substantial proportion of all polyps with characteristics of advanced adenoma were observed in polyps <10 mm. We then recommended the removal of all neoplastic polyps, regardless of polyp size, whether the patient is young or old.

The malignant potential of adenomas is generally considered to correlate with their size, location, and morphology. Our findings indicate that the polyp location is closely, but not independently, associated with abnormal developmental changes in colorectal adenomas. Adenomas detected by screening colonoscopy were more frequent in the distal colon than in the proximal colon, especially advanced adenomas,[12,30,31] which was in line with our study. Studies[12,32,33] also focused on the status of the proximal colon based on findings in the distal colon. They found that the relative risk of proximal colorectal adenomas was higher in patients with distal colorectal adenomas than in those without. Right-sided CRC increases in older adults, and Yamaji et al[34] have revealed a right-side shift in the location of new colorectal adenomas with age. In our study, together with that of Saudi Arabia,[35] the majority of neoplastic polyps were located in the left colon. That seems to support the development of an adenoma-carcinoma sequence. Furthermore, multivariate logistic regression analysis showed that pedunculated polyp was an independent predictor of advanced histology (OR = 1.5, *P* = .001). In short, we emphasized the necessity of biopsy and colonoscopic surveillance in young populations with pedunculated polyps.

This was a retrospective study with some limitations. First, the inclusion cohort included patients from 2 endoscopic centers who underwent polypectomy, therefore, a selection bias exists. Second, it was not a population-based screening study, and the current data cannot permit the establishment of the absolute prevalence of colorectal polyps in the young population. Measurements by endoscopists are generally used for clinical decision making. The proportion of polyps shown here may not be sufficient to establish a benchmark for clinical practice, but we provide some indicative value for designing effective population-based CRC screening. Prospective studies in more centers and with larger sample sizes are needed in the future. Finally, our study relied on polyp size reported by the endoscopist, the accuracy of which may be affected by individual differences. However, there are no standards on how to measure the size of polyps, so such a limitation probably applies to most studies concerning polyp size measurement.

5. Conclusions

In summary, our study demonstrated that specific characteristics of colorectal polyps, such as large and pedunculated, are associated with advanced histology in young patients, highlighting the importance of excision. In addition, owing to the large proportion of advanced histopathology related to small polyps, it is recommended that endoscopists resected all neoplastic polyps detected during colonoscopy and submit them for histology.

Author contributions

Conceptualization: Meng Que Xu.
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Investigation: Yu Qin Shen, Ming Yong Di.
Validation: Ming Yong Di.
Writing – original draft: Yu Qin Shen.
Writing – review & editing: Meng Que Xu, Zeng Yan Xue.

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