

Chinese literature associated with diagnosis of *Helicobacter pylori*

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Abstract

AIM: To synthetically analyze and probe into the diagnosis of *H pylori* infection, we followed the principles of evidence-based medicine.

METHODS: A total of 22 papers of prevalence survey and case-control studies were selected for studying about diadynamic methods. Using meta-analysis, we analyzed the different diadynamic methods of *H pylori* in China.

RESULTS: Through meta-analysis, among the five diadynamic methods, the accuracy of polymerase chain reaction (PCR) was the highest (98.47%) and PCR was the most sensitive method (*Sp*: 99.03%).

CONCLUSION: Among the five diadynamic methods, the accuracy of PCR is the highest and PCR is the most sensitive method to diagnose the infection of *H pylori*.

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INTRODUCTION

Since *Helicobacter pylori* (*H pylori*) was first isolated in 1982,

the association of *H pylori* and related diseases has become the hot spot of gastroenterological studies. The distribution of *H pylori* infection is worldwide, and the prevalence rate of *H pylori* among populations is very high. With the deepening of *H pylori* researches, studies about *H pylori*, which aimed at effectively controlling the infection, were of great significance in preventing and curing the chronic stomach troubles. Because of the independence of each study and limit to the region and sample source, a great majority of studies did not have enough evidence and totally unanimous conclusion, which influenced the reliability of the conclusion. However, meta-analysis method could appraise and analyze synthetically the results of study with the same research purpose^[1], thus improving the efficiency of statistics, solving the problem with inconsistent results of studies, and making the conclusion of study more reliable. Therefore, we used meta-analysis to analyze synthetically the results of studies associated with *H pylori* diagnosis so as to express them more accurately.

MATERIALS AND METHODS

Literature selection and data

A Chinese biology and medicine database (CBM) search of non-review articles since 1995 was performed with the MeSH headings "*Helicobacter pylori*", "diagnosis", "polymerase chain reaction", "enzyme-linked immunosorbent assay" and "urea enzymes test".

Standard of selection The research objects were the population who could possibly suffer from *H pylori*, and the results of study had intact statistics.

***H pylori*-positive result judgment** *H pylori* cultivation was positive or one or two of the followings were positive: *H pylori* morphology (smear, histology or immunohistochemistry), urea enzyme test (RUT, ¹³C or ¹⁴C-urea breath test), PCR detection, serologic test (ELISA or immunoblotting test, etc.).

Standard of rejection The sample size was too small for statistical study, children less than one year old who possibly carried mother's antibody, studies without definite detection of *H pylori* or strict quality control.

Study on diadynamic methods of *H pylori* The literature search result were classified as follows. Twenty-two reports^[2-23] appraised synthetically according to 5 commonly used clinical diagnostic methods, the evaluation targets included sensitivity (*Se*), specificity (*Sp*) and accuracy (π). Bibliographic retrieval results of ¹³C-urea breath test, ¹⁴C-urea breath test, ELISA, RUT and PCR are shown in Tables 1-5.

Table 1 Related literature of ¹³C-urea breath test

Study No. (i)	<i>H pylori</i> positive		<i>H pylori</i> negative		<i>Se</i> (%)	<i>Sp</i> (%)	π (%)	<i>PV</i> (%)	<i>PV</i> ₊ (%)
	<i>a</i>	<i>c</i>	<i>b</i>	<i>d</i>					
1	36	0	0	24	100	98.50	99.40	100	100
2	148	5	0	165	96.70	100	98.41	97.06	100
3	13	0	1	23	100	95.83	97.41	100	92.86
4	39	3	0	10	92.86	100	94.23	76.92	100
5	42	0	0	10	100	96.97	99.42	100	100
6	52	2	3	13	96.30	81.25	92.86	94.55	86.67
7	47	1	0	32	97.92	100	98.75	97.14	100
8	147	3	0	3	98	90.70	97.86	96.10	95.30
9	74	3	0	49	96	100	97.56	94.23	100

Table 2 Related literature of ¹⁴C-urea breath test

Study No. (i)	<i>H pylori</i> positive		<i>H pylori</i> negative		<i>Se</i> (%)	<i>Sp</i> (%)	π (%)	<i>PV</i> (%)	<i>PV</i> ₊ (%)
	<i>a</i>	<i>c</i>	<i>b</i>	<i>d</i>					
1	81	2	2	52	97.06	96.12	96.69	95.12	97.06
2	52	5	0	23	91.23	100	93.73	82.14	100
3	51	1	2	16	97.36	88.89	95.47	97.36	96.23
4	56	3	1	59	94.92	98.33	96.61	95.16	98.25
5	83	0	3	75	100	96.15	98.35	100	96.51
6	78	5	2	76	93.98	97.44	95.65	93.83	97.50
7	79	4	2	76	95.18	97.44	96.27	95	97.53

Table 3 Related literature of ELISA

Study No. (i)	<i>H pylori</i> positive		<i>H pylori</i> negative		<i>Se</i> (%)	<i>Sp</i> (%)	π (%)	<i>PV</i> (%)	<i>PV</i> ₊ (%)
	<i>a</i>	<i>c</i>	<i>b</i>	<i>d</i>					
1	85	11	2	38	88.54	95	90.41	77.55	97.70
2	55	2	2	26	96.49	92.86	95.25	92.86	96.49
3	38	6	2	13	86.36	86.67	86.44	68.42	95
4	43	1	1	14	97.37	93.33	96.34	93.33	97.73
5	37	7	4	11	84.09	73.33	81.35	61.11	90.24
6	64	2	2	15	96.97	88.23	95.18	88.24	96.97
7	44	0	3	12	100	80	94.92	100	93.62

Table 4 Related literature of RUT

Study No. (i)	<i>H pylori</i> positive		<i>H pylori</i> negative		<i>Se</i> (%)	<i>Sp</i> (%)	π (%)	<i>PV</i> (%)	<i>PV</i> ₊ (%)
	<i>a</i>	<i>c</i>	<i>b</i>	<i>d</i>					
1	34	2	0	24	94.44	100	96.64	92.31	100
2	32	10	0	10	76.19	100	80.77	50	100
3	38	4	1	9	89.74	90.91	89.97	69.23	97.44
4	30	2	2	17	93.75	89.47	92.16	89.74	93.75
5	55	4	7	53	93.22	88.33	90.73	92.98	88.71
6	62	4	4	13	93.94	76.47	90.36	76.47	93.94
7	46	8	4	12	85.52	75	83.12	60	92
8	151	50	11	47	75.12	81.03	76.35	48.45	93.21
9	171	30	7	51	85.07	87.93	85.84	62.96	96.07
10	72	15	0	63	82.76	100	90.02	80.77	100
11	227	22	6	29	91.16	82.86	90.05	56.86	97.42
12	73	14	0	63	83.91	100	90.66	81.82	100
13	58	7	1	30	89.23	96.77	91.65	81.08	98.31
14	34	0	7	28	100	80	89.86	100	82.93
15	64	15	3	13	81.01	81.25	81.05	46.43	95.52

Table 5 Related literature of PCR

Study No. (i)	<i>H pylori</i> positive		<i>H pylori</i> negative		<i>Se</i> (%)	<i>Sp</i> (%)	π (%)	<i>PV</i> (%)	<i>PV</i> ₊ (%)
	<i>a</i>	<i>c</i>	<i>b</i>	<i>d</i>					
1	178	0	0	98	100	100	100	100	100
2	32	0	5	14	100	73.68	90.19	100	86.49
3	34	0	1	34	100	97.14	98.53	100	97.14
4	34	2	1	34	94.44	97.14	95.73	94.44	97.14
5	149	0	0	10	100	100	100	100	100
6	77	2	2	14	97.47	87.50	95.82	87.50	97.47

Methods

In the statistical analysis of data, Meta-analysis method with a fixed effect model and a random effect model was used to reach an integrated conclusion^[24-26].

RESULTS

Among the five diadynamic methods, the accuracy of PCR was the highest and PCR was the most sensitive method, specificity of ¹³C-urea breath test was the highest, the sensitivity and accuracy of RUT were the lowest, specificity of ELISA

was the lowest (Table 6).

Table 6 Synthetic evaluation of five diadynamic methods

Diadynamic methods	<i>Se</i> (%)	<i>Sp</i> (%)	π (%)
¹³ C-urea breath test	99.34	95.09	97.78
¹⁴ C-urea breath test	97.56	94.96	96.40
ELISA	93.96	81.78	90.09
PCR	98.25	99.03	98.47
RUT	95.58	71.19	87.02

DISCUSSION

This study used bibliographic retrieval to collect the relevant materials of *H pylori* infection, and meta-analysis, including combination of statistics in many studies by weight and equalized test, to analyze the diagnosis of *H pylori* infection.

The five diadynamic methods of *H pylori* infection all had a high sensitivity, specificity and accuracy, among which PCR was most sensitive and accurate. ¹³C-urea breath test was the most specific. As an ideal diadynamic method, it should have the following advantages: a high sensitivity and specificity, minimal incursions into or no damage to patients, simple and convenient in manipulation, less sophisticated technique or equipment, low cost and easy acceptance by patients. However, in fact, it is difficult for one diadynamic method to possess all these qualities. Above all, among the five diadynamic methods of *H pylori* infection, ELISA is the most convenient, which has the lowest cost and damage, therefore, serological positivity can merely explain the situation of whether patients have been infected or being infected. ¹³C-urea breath test has no harm, and can provide the whole infection information of stomach, which is relatively ideal, but it is difficult to popularize for the need of equipments and high expense. Although ¹⁴C-urea breath test can be done by well-equipped hospital and has lower cost than ¹³C-urea breath test, it has some radioactivity risk. RUT belongs to indirect test, whose intensity is determined by bacterial density of biopsy specimen. PCR is more sensitive than other methods. PCR can also detect *H pylori*, which cannot be detected by other methods, and at present it has been widely used in detection of various kinds of clinical specimens^[27]. So which diadynamic methods would be adopted in clinical detection must be determined according to the specific situation and different requirements^[28-32].

H pylori infection is common and study of *H pylori* infection involves a wide extent. A large number of researches and works on this aspect have been done in China, and have achieved a great progress, although some problems were found in these studies such as flaw in experimental design, scattered data, deficiency of objective and reliable conclusion. Therefore, many aspects of *H pylori* infection are still to be studied to obtain accurate and consummate results.

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