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RESEARCH ARTICLE

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Comparison of characteristics of urine specimens at physiological state versus post-artificial heating at the National Traditional Medicine Hospital, Bhutan

Karma Ugyen[1], Nima Dema[1], Damcho Wangchuk[2], Sangay Thinley[3], Tempa Gyeltshen[4], Sherab Tenzin[5], Karma Tenzin[6]

ABSTRACT

Introduction: Urine reflects the body's functional status playing a central role in the diagnosis of disease conditions. This study aimed to compare six of the nine features of urine at physiological and lukewarm states after artificial heating – colour, odour, steam, bubbles, sediment, and frothiness.

Method: This comparative study utilized the Bhutan Analysis System for Urine Properties (BASUP) chart. The study was conducted from July 2021 to January 2022 at the Eastern Regional Referral Hospital, Wangdicholing District Hospital, and the National Traditional Medicine Hospital. The properties of urine were evaluated soon after collection at physiological state. After the urine specimen had cooled down to room temperature, it was heated to body temperature following a standard procedure for reassessment of its properties.

Results: A total of 91 specimens from 35 men and 56 women were analysed. There were no significant differences observed in the colour, odour, steam, bubbles, sediment, or frothiness between physiological and artificially heated specimens. However, there were differences in the colours of དམར་ཕས་ཆེབ། (*Marshechewa*) with p = 0.023 and སེར་ཕས་ཆེབ། (*Sershechewa*) with p = 0.015.

Conclusion: The study found no significant differences in the majority of the properties of urine in specimens at physiological state and after artificial heating. However, further studies are required to evaluate the physicochemical properties and the differences in the *Marshechewa* and *Sershechewa* colours noted.

Keywords: Diagnosis; Traditional Medicine; Observation; Urinalysis; Urinary Sediment Analysis

INTRODUCTION

Traditional Medicine (TM), known as *Sowa Rigpa*, holds that the human body consists of three primary elements: *rLung* (Air), *mKhris-pa* (Bile), and *Badkan* (Phlegm). A state of health is achieved when these elements are in harmonious balance within the body [1]. In TM, the primary diagnostic techniques are pulse reading and urine analysis. Urine reflects the body's metabolism and the functional status of various organ systems [2].

In *Sowa Rigpa*, urine analysis is regarded as the most distinctive and effective diagnostic method due to the extensive clinical information it provides. There are nine clinical features assessed at three different temperature states. Historically, urine analysis at the National Traditional Medicine Hospital

Corresponding author ✉ : Karma Ugyen, National Traditional Medicine Hospital, Thimphu, Bhutan. Email: ugyensangay@gmail.com

[1]National Traditional Medicine Hospital, Thimphu, Bhutan
[2]Traditional Medicine Unit, Wangdicholing Hospital, Bumthang, Bhutan
[3]Traditional Medicine Unit, Eastern Regional Referral Hospital, Mongar, Bhutan
[4]Faculty of Traditional Medicine, Khesar Gyalpo University of Medical Sciences of Bhutan, Thimphu, Bhutan
[5]Menjoring Sorig Pharmaceuticals, Thimphu, Bhutan
[6]Faculty of Postgraduate Medicine, Khesar Gyalpo University of Medical Sciences of Bhutan, Thimphu, Bhutan

(NTMH) was performed on cold samples, which is different from the natural physiological state at body temperature. At the NTMH, this method was officially adopted in 2014 following thorough deliberations among traditional medicine practitioners. The practice of heating urine for analysis was first introduced by Sangay Gyatso (1652 – 1705) in Tibet [3, 4].

Urine is analysed at three temperature stages: body temperature, lukewarm, and cold stages. Soon after evacuation from the bladder at body temperature, the urine specimen is evaluated for colour, vapour, odour, and bubbles. At the lukewarm stage, the specimen is evaluated for frothiness and sediments. In the cold stage, the timing and pattern of colour changes, along with the clarity or cloudiness of the fluid after transformation are recorded (Figure 1) [5]. The location of sediments in the tube indicates the location of the disease in the body (Figure 2). Sediments at the upper part of the test tube suggest symptoms like dizziness, heart, or lungs-related issues; sediments at the middle part of the test tube suggest indicate liver or spleen-related disorders; and sediments at the lower part of the test tube point to colon, intestine, kidney and bladder issues, lower body *rlung* problems, or diarrhoea [6].

The characterization of the colour of the specimen was compared to the standard template from the Bhutan Analysis System for Urine Properties (BASUP) chart 2021 (Figure 3). This was developed through expert consultation among Traditional Medicine experts at the NTMH, Thimphu, Bhutan.

As per *Sowa Rigpa* text, it is preferred that the characteristics of urine specimens are assessed at physiological state [7]. However, this method is often not feasible owing to patient timing for hospital visit. Thus, it is important to determine whether the characteristics of artificially heated urine specimens are comparable to those from specimens in their natural physiological state. Therefore, the objective of this study was to compare the characteristics of artificially heated urine specimens with that of characteristics as physiological state.

METHODS

Study Desin

This was an observational study. In this study, the following selected characteristics were compared with urine specimens analysed at physiological state (soon after evacuation) and after artificial reheating to body temperature: colour, vapour, odour, bubbles, sediment and frothiness.

Study site

This study was conducted at the National Traditional Medicine Hospital, Thimphu; Eastern Regional Referral Hospital, Mongar; and Wangdicholing Hospital, Bumthang between July 2021 and January 2022.

Study population, sample size and sampling method

All patients visiting the selected hospitals, irrespective of their diagnoses, were invited to participate in the study. The patients were provided advices on di-

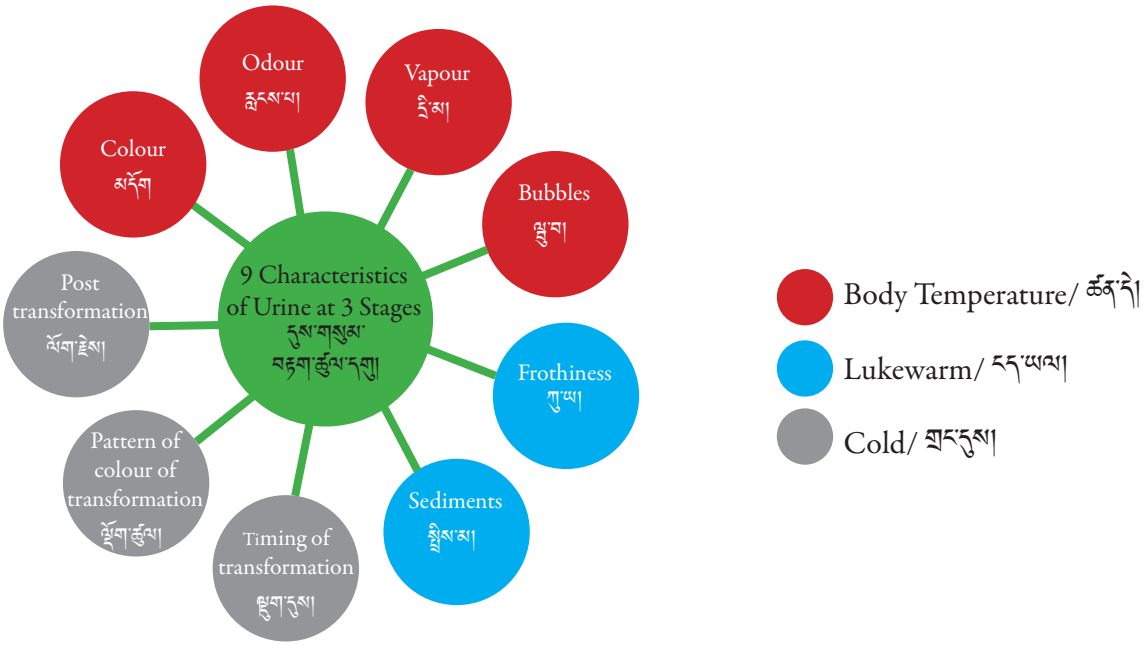

Figure 1. The nine properties of urine specimen assessed at body temperature, at lukewarm and in cold stages. The properties of specimen in cold stages were not included in this study.

etary restrictions (avoidance strong tea, butter milk, alcohol and milk) and behaviour restrictions (avoidance of dehydration, sleep deprivation, sexual activities, mental stress, and excessive physical activity) as per the *Sowa Rigpa* text until specimen collection [8]. All patients who consented and reported to the hospital to provide their specimens were included.

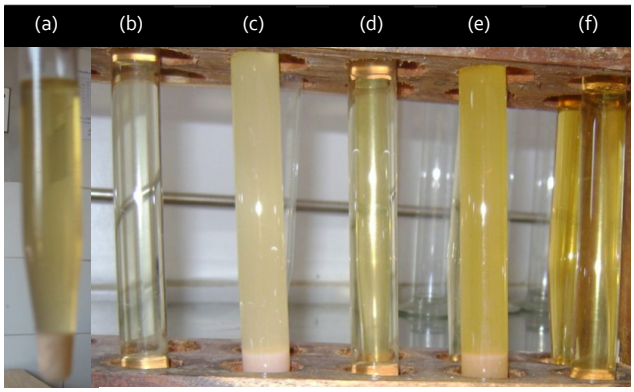

Figure 2. Positions of urine sediments in a test tube. In tubes, (a), (c) and (e), the sediments at the bottom. In tube (d), the sediments are in middle layer of the tube. In tubes, (b) and (f), there are minimal sediments dispersed across all three layers of the test tube.

Urine specimen collection and handling

The flow of patients involving screening, collection and analysis of urine specimens is shown in Figure 4. Among the nine clinical features of urine, three related to cold-state specimens were excluded, as the study focused on comparing artificially heated urine with its physiological state.

Assessment of urine properties at physiological state

Step 1

A sterile container was handed over to the patient to collect about 40 mL of mid-stream urine. This specimen was handed over within one minute to the TM physician and the urine characteristics at physiological and warm states (vapour and odour) were recorded.

Step 2

From this specimen, 30 mL of the specimen was transferred into a ceramic bowl (Figure 5a) to assess colour and bubbles, and the remaining 10 mL of urine was transferred into a test tube and allowed to settle sediments for 20 minutes.

Step 3

Urine characteristics at a lukewarm stage were recorded: sediments and frothiness. Following this, the specimen was left still at room temperature for 20 minutes and the position of the sediments (upper, lower or bottom layer) in the test tube was recorded.

Assessment of urine properties after artificial heating

Step 4

The specimen from the ceramic bowl and test tube was transferred into a beaker with a thermometer, and was then immersed in a jar containing hot water when the temperature of the specimen reached 37 °C (Figure 5b), the contents were poured back into the ceramic bowl to assess colour, bubbles and odour.

The procedure for assessment of urine characteristics after artificially re-heading is described in the Standard Operating Procedure adopted by the NTMH, 2014 [9]. The template for reporting the urine characteristics after artificial heating is shown in Figure 6.

Data collection

The data on the characteristics of urine specimens were recorded in a pro forma that was designed for the purpose for this study. The TM physicians at all the three participating sites were trained through a workshop on the use of the pro forma and the use of BASUP chart.

Data analysis

The data was double entered and validated using EpiData Version 3.1 (EpiData Association, Odense, Denmark). STATA version 13 (licenced Khesar Gyalpo University of Medical Sciences of Bhutan) was used for analysis. The comparison of the six characteristics were made using chi squared test. P values < 0.05 to as considered significant.

Ethics considerations

Ethics approval for this study was obtained from Research Ethical Board of Health, Ministry of Health, Royal Government of Bhutan (REBH/approval/2020/10053). Administrative clearance was obtained from the Policy and Planning Division, Ministry of Health and from the respective Medical Superintendents of the hospitals. Informed consent was taken from the study participants prior to specimen collection.

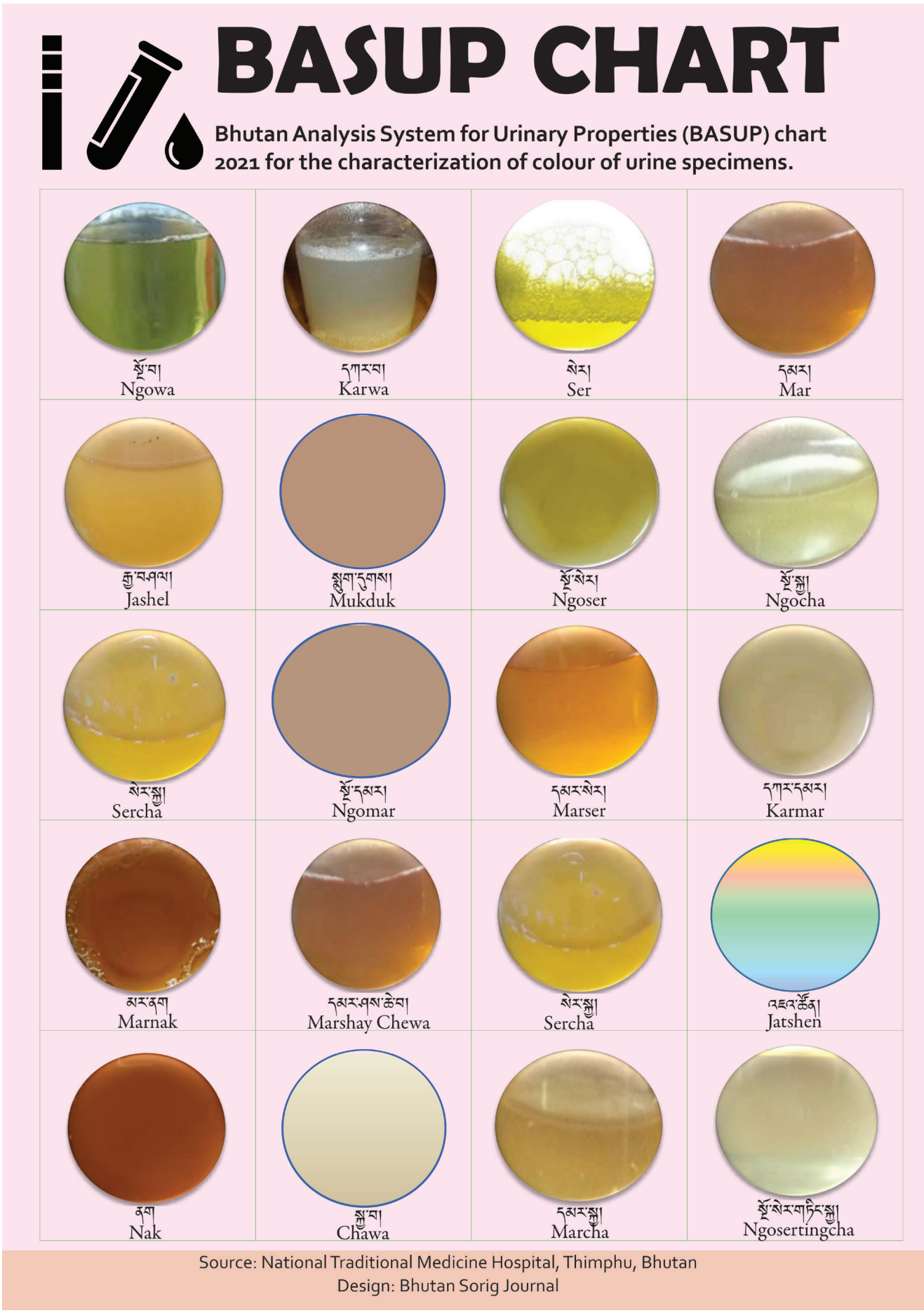

Figure 3. Bhutan Analysis System for Urinary Properties (BASUP) chart 2021 for the characterization of colour of urine specimens.

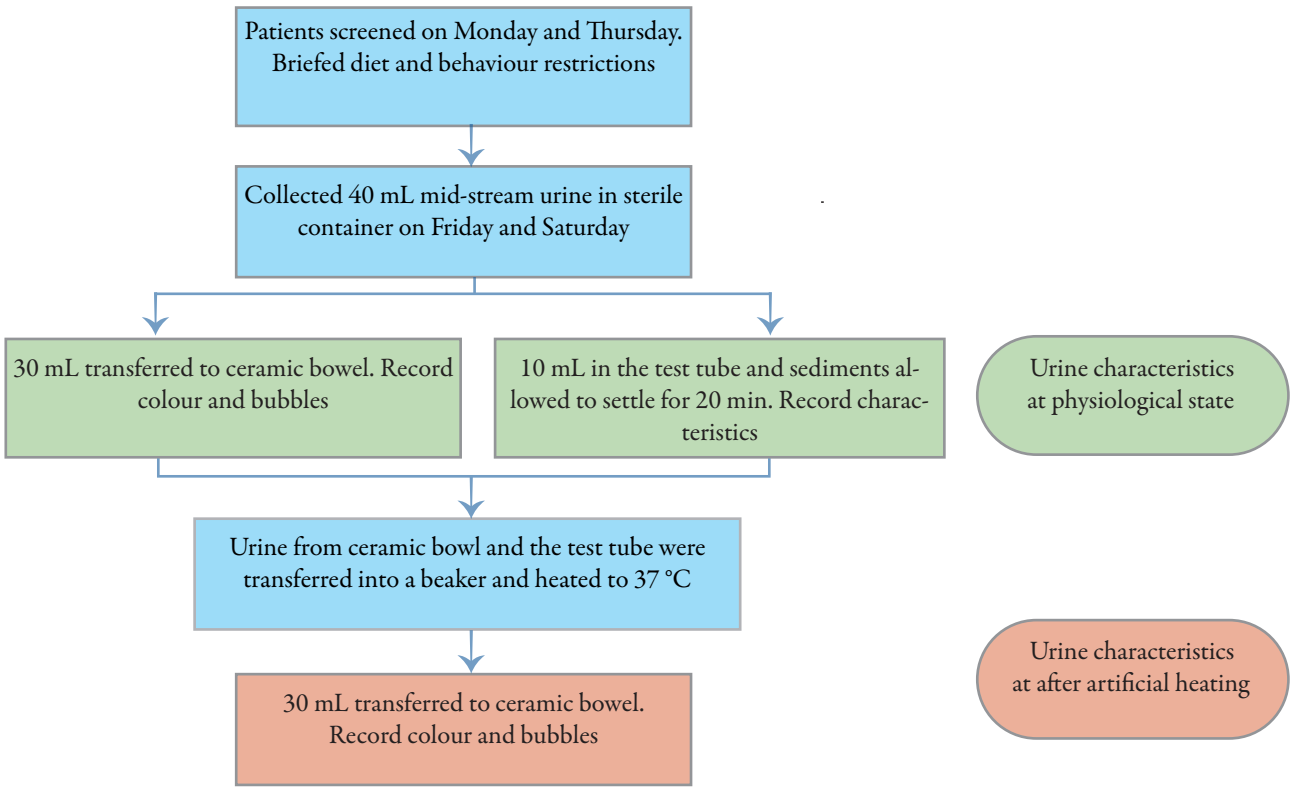

Figure 4. Schematic diagram on the observation and recording of urine characteristics at physiological state (soon after evacuation) and after artificial heating of cooled specimen to body temperature

RESULTS

There were 91 urine specimens examined: 29 at NTMH and 31 each at Wangdicholing Hospital and Eastern Regional Referral Hospital. These specimens were from 35 male and 56 female participants.

The details of comparison of colour, odour, steam and bubbles is shown in Table 1. In the comparison of urine colour, there were no differences in སྔོ་བ། (*Ngowa*), དཀར། (*Kar*), སེར། (*Ser*), སྔོ་སེར། (*Ngoser*) , སྔོ་སྐྱ། (*Ngocha*), དམར་སེར། (*Marser*), སྔོ་དཀར། (*Ngokar*) and others such as སེར་སྐྱ། སྔོ་དམར། རྒྱ་ཤེལ། དཀར་སེར། དམར་སྐྱ། དམར། དམར་ནག. However, there were significant differences in the colours of དམར་ཤས་ཆེབ། (*Marshechewa*) with p = 0.023 and སེར་ཤས་ཆེབ། (*Sershechewa*) with p = 0.015.

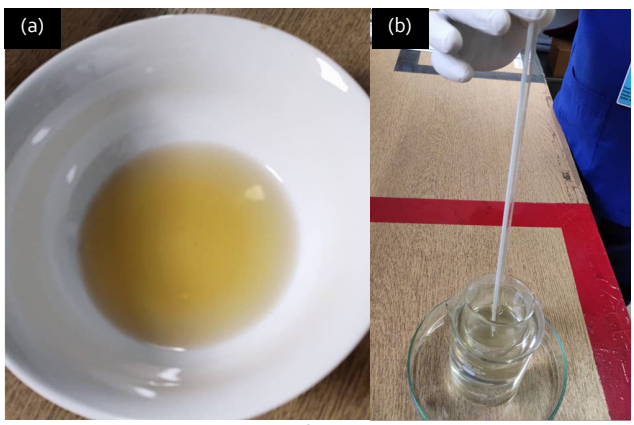

Figure 5. (a) Observation of urine colour and bubbles in a ceramic bowl with white background. (b) A beaker of urine that was heated to 37 °C

In the comparison of urine odour, there were no differences in དྲི་ཆེབ། (*Drechewa*), དྲི་ཆུང་བ། (*Drechungwa*) and other odours གསུར་དྲི། and ཟས་དྲི།.

In the comparison of steam, there were no differences in ཆང་སྐ་ཆེ། (*Langchewa*), ཆང་སྐ་ཆུང་། (*Langchungwa*) and other forms of steam རེས་ཆེ་རེས་ཆུང་། and ཡུན་ཐུང་།.

In the comparison of bubbles, there were no differences in སྔོ་ལ་ཆེབ། (*Ngolachewa*), ཐ་སེར་སངས་སྐྱེན། (*Thrasersangken*), མཆེལ་མ་འདྲ་བ། (*Chelmadrawa*), ཇ་ཤེན་ཚོན་འདྲ་བ། (*Jatshendrawa*), ཚེག་སྒྲ་ཡལ་བ། (*Tsheg Dra Yelwa*), བརྟན་པ། (*Tenpa*), གོ་པ། (*Goepa*), གསོག་བརྟན། (*Sog Ten*) and ཡལ་བྱལ་བ། (*Yel Bulwa*).

The details of comparison of *trema* and sediments is shown in Table 2. In the comparison of *trema*, there were no differences in སྦ་པ། (*Sapa*), མཐུག་པ། (*Thukpa*), ལྕང་བཞག། (*Langzha*) and དུམ་བུར་ཆད་པ། (*Domburchewa*).

In the comparison of sediments, there were no difference in སྤུ་ཙེ་འདྲ་བ། (*Putse-drawa*), སྤྲིན་འདྲ་བ། (*Tren-drawa*), ཇེ་མ་འདྲ་བ། (*Jema-drawa*), མཐུག་པ། (*Thukpa*), གསུམ་གཅན་པ། (*Sumgacham*), བར་གནས། (*Barnepa*), འོག་གནས། (*Wognepa*), ཞོ་ཤེ་འདྲ་བ། (*Zhoshedrawa*), སྦ་པ། (*Sapa*), སྤུ་འདྲ་བ། (*Pudrawa*) and བལ་འདབ་ཆུསྐྱེར། (*Baldap chuchur*).

DISCUSSION

This study demonstrates that the majority of the characteristics of urine specimens artificially heated to body temperature were similar to that at physiological state. This study was done to assess if

ནད་པའི་དྲི་ཚུགཔ་དཔྱད་འཕྲི་མོག

སྨན་ཁང་གི་མིང།			ཟླ་ཚེས།				
ནད་པའི་མིང།			ལོ།		ཨོ། ☐	མ། ☐	
ཁ་བྱང།			གསར་པ། ☐		རྒྱིན་མ།	རྒྱུན་ཞུང།	
ཚོན་ཅིའི་དུས་				**དད་ཡལ་དུས་**		**གྲང་བའི་དུས་**	
མཇོག	**རྒྱབ་མ**	**དྲི**	**མོ་ཏོག**	**ཀུ་ཡ**	**སྐྱིས་མ**	**ཚྭོག་དུས**	**ཚོག་ཚུལ**	**ལོག་རྟེས**
སྤོ།	ཆེ།	དྲི་ཆེ།	སྤོ་ལ་ཆེ་བ	སྨུག་འདྲ་བ	སྐབ་པ	རྣངས་མ་ཡལ་བ་ཚྭོག་པ	མཐའ་ནས་ལྷོག་པ	སྐྱ་བ
སེར	ཆུང	དྲི་ཆུང	ཕྱ་སེར་སངས་སྐྱེན	བལ་འདབ་ཆུར་སྐྱུར	མཐུག་པ	ཡལ་རྟེས་ལྷོག་པ	གཏིང་ནས་ལྷོག་པ	ཀ་ཅང་སྐྱ་བ
དཀར	ཡུན་རིང	གཡའ་དྲི	མཆིལ་མ་འདུ་བ	སྨུ་ཆེ་འདྲ་བ	བྱང་བ་བཞག	ཡལ་ལྷོག་མཚུངས	མཐའ་ནས་དབུས་སུ་ལྷོག་པ	སྨུ་བ
དམར	ཡུན་ནུང	གསུར་དྲི	དམར་བ	སྨིན་འདུ	དུམ་བུར་ཆད་པ		སྤོན་ཏུ་ལྷོག་པ	ཀ་ཅང་སྨུ་བ
རྒྱ་བཤལ	རེས་ཆེ	ཤིག་དྲི	འཇའ་ཚོན་འདུ་བ	རྣག་འདུ	སྨིས་མེད་པ		མི་ལྷོག་པ	དོག་སྟོན་པ
སྨུག་དུགས	རེས་ཆུང	ཚོལ་དྲི	ཕུག་རོན་ཁྲས་གཏེར་འདུ	ཀྱེ་བ་འདྲ་བ				དངས་བ
སྤོ་སེར		ཁཐ་དྲི	ཆོག་སྨུ་ཡལ་བ	སྐེད་གནས				
སྤོ་སྐྱ		ཀུད་དྲི	བརྟན་པ	བར་གནས				
སེར་སྐྱ		ལཁ་ལོའི་དྲི་མ	རྐོད་པ	འོག་གནས				
སྤོ་དམར		རྣག་དྲི	གསོག་བརྟན	ཞོ་ཤི་འདྲ་བ				
དམར་སེར		ཀོ་རྩལ་དྲི	ཕྱུར་བུར་འོང་བ	མཐུག་པ				
དཀར་དམར		ཟས་དྲི	ཆོག་སྨུ་མེད་པ	སྐབ་པ				
མར་ནག			ཡལ་བྱལ་བ	གསུམ་གཅུག				
དམར་ཤེས་ཆེ་བ								
སེར་ཤེས་ཆེ་བ								
འཇའ་ཚོན								
ནག								
སྐྱ་བ								
སྤོ་སེར་གཉིང་སྐྱ								
དམར་སྐྱ								
མདོག་ཆག་འདུ་བ	དྲན་གསོ།							
སྤོ་ཚོད་ཐུ་འདུ་བ								
ཚུ་རྩ་ཆད་པ་འདུ་བ								
ཏོ་མ་ཤི་འདུ་བ								
མཚལ་ཆད་འདུ་བ	དྲི་ཚུགཔ་ཞིབ་འགོ་དཔོན།							

Figure 6. Bhutan Urinalysis Report Form, 2014

Table 1. Comparison of colour, odour, steam and bubbles of urine specimens at physiological state (body temperature) and in specimens artificially heated to body temperature in Bhutan, 2021 – 2022 (n = 91)

Urine characteristics	Urine specimen at physiological state		Urine specimen artificially heated to body temperature		p value
	n	%	n	%	
མདོག། **(Colour)**					
སྔོ་བ། (*Ngowa*)	4	4.40	4	4.40	1.00
དཀར། (*Kar*)	6	6.59	6	6.59	1.00
སེར། (*Ser*)	14	15.38	8	8.79	0.256
སྔོ་སེར། (*Ngoser*)	14	15.38	11	12.09	0.667
སྔོ་སྐྱ། (*Ngocha*)	5	5.49	7	7.69	0.765
དམར་སེར། (*Marser*)	18	19.78	14	15.38	0.559
དམར་ཤས་ཆེ་བ། (*Marshechewa*)	1	1.10	9	8.89	0.023
སེར་ཤས་ཆེ་བ། (*Sershechewa*)	11	12.09	20	21.98	0.015
སྔོ་དཀར། (*Ngokar*)	4	4.40	2	2.20	0.678
Others (སེར་སྐྱ། སྔོ་དམར། རྒྱ་ཤེལ། དཀར་སེར། དམར་སྐྱ། དམར། དམར་ནག)	14	15.38	10	10.09	0.511
དྲི་མ། **(Odour)**					
དྲི་ཆེ་བ། (*Drechewa*)	49	53.85	40	43.96	0.236
དྲི་ཆུང་བ། (*Drechungwa*)	38	41.76	46	50.55	0.298
Others (གསུང་དྲི། ཟས་དྲི།)	4	4.40	5	5.50	1.000
ཆུངས་པ། **(Steam)**					
ཆུངས་ཆེ། (*Langchewa*)	13	14.29	8	8.79	0.353
ཆུངས་ཆུང་། (*Langchungwa*)	74	81.32	79	86.81	0.418
Others (རེས་ཆེརེས་ཆུང་། ཡུན་ཐུང་)	4	4.40	4	4.40	1.000
ཀླུ་བ། **(Bubbles)***					
སྔོ་ལ་ཆེ་བ། (*Ngolachewa*)	45	49.45	53	58.24	0.298
ཐྲ་སེར་སངས་སྐྱེན། (*Thrasersangken*)	59	64.83	63	69.23	0.636
མཆིལ་མ་འདྲ་བ། (*Chelmadrawa*)	26	28.57	23	25.27	0.738
འཇའ་ཚོན་འདྲ་བ། (*Jatshendrawa*)	3	3.29	3	3.29	1.000
རྩེག་སྐྲ་ཡལ་བ། (*Tsheg Dra Yelwa*)	58	63.73	55	60.43	0.760
བརྟན་པ། (*Tenpa*)	15	16.48	11	12.08	0.525
གོད་པ། (*Goepa*)	15	16.48	11	12.08	0.525
གསོག་བརྟན། (*Sog Ten*)	1	1.09	1	1.09	1.000
ཡལ་བུལ་བ། (*Yel Bulwa*)	8	8.79	7	7.69	1.000
དམར་བ། ཕྱག་རོན་ཁ་གཏམ་གཏོར་འདྲ། ཕྱུར་བུར་འོང་བ། རྩེག་སྐྲ་མེད་པ།	0	-	0	-	

*Multiple responses allowed

artificial heating of urine specimens had any untoward alteration of its characteristics. The findings from this study support the practice of artificial heating of urine specimens aligning with the methodology utilized by Sangay Gyamtsho [10].

The comparison between physiological and artificially heated urine samples showed that most cloudiness and sediment characteristics remain consistent across both methods. The thick and thin sediments in urine play a crucial role in disease diagnosis was said by Yothok Yoenten Gonpo, "རྒྱལ་དེས་ཐེ་ལྟར་འདུག་ཀྱང་རུང་། །ཀུ་ཡ་མཐུག་ན་ཚོ་བ་དང་། །ཀུ་ཡ་སྦག་ན་གདར་བ་ཡིན། ། In addition to the eight clinical characteristics, the key factor in analysis of urine is the sediment." According to his teaching, thick sediments in the urine point to heat-related diseases, while thin sediments indicate cold-related conditions [4, 11].

No significant disparities were detected across all parameters concerning frothiness and sediments between the two methods. This finding aligns with the statement "དར་ཡལ་དུས་སུ་ཀུ་ཡ་སྨིས་མ་བརྟག" which describes that frothiness and sediments are typically observed in the lukewarm stage, where temperature variation is minimal across both urine samples [12].

According to the Subsequent Tantra, the presence of thick and thin concentration frothiness layers on the urine surface suggests hot and cold disorders, respectively [13]. Among the five frothiness specimens analysed, there was no turnover observed in the "*Trema thukpa*/Very thick frothiness" and "*Tremen*/No frothiness" categories. This lack of turnover indicates that there were no extreme patterns of hot and cold conditions among the participants in this study. The *Sowa Rigpa* phrase "སྨིས་མ་སྦག་ན་གདར་བ་ཐུག་ན་ཚོ" highlights the connection between urine frothiness and the body's internal heat. Thick frothiness in the urine

Table 2. Comparison of *trema* and sediments of urine specimens at physiological state (body temperature) and in specimens artificially heated to body temperature in Bhutan, 2021 – 2022 (n = 91)

Urine characteristics	Urine specimen at physiological state		Urine specimen artificially heated to body temperature		p value
	n	%	n	%	
སྨིས་མ། **(*Trema*)**					
སྦག་པ། (*Sapa*)	28	30.77	27	29.67	1.00
མཐུག་པ། (*Thukpa*)	62	68.13	64	70.33	0.872
ཐང་མ་བཞག། (*Langzha*)	0	-	0	-	-
དུམ་བུར་ཆད་པ། (*Domburchewa*)	1	1.10	0	-	-
ཀུ་ཡ། **(*Sediments*)***					
སྤུ་རྩེ་འདྲ་བ། (*Putse-drawa*)	12	13.19	10	10.99	0.820
སྨིན་འདྲ་བ། (*Tren-drawa*)	9	9.89	15	16.48	0.273
རྒྱ་མ་འདྲ་བ། (*Jema-drawa*)	52	57.14	60	65.93	0.286
མཐུག་པ། (*Thukpa*)	47	51.65	48	52.75	1.000
གསུམ་གཅམ་པ། (*Sumgacham*)	34	37.36	29	31.87	0.533
བར་གནས་པ། (*Barnepa*)	1	1.10	4	4.40	0.364
འོག་གནས། (*Wognepa*)	22	24.18	29	31.87	0.322
ཞོ་ཤི་འདྲ་བ། (*Zhoshedrawa*)	10	10.9	8	8.79	0.804
སྦག་པ། (*Sapa*)	28	30.77	31	34.77	0.751
སྤུ་འདྲ་བ། (*Pudrawa*)	34	37.36	32	35.16	0.877
བལ་འདབ་ཆུ་ཚུར། (*Baldap chuchur*)	16	17.58	16	17.58	1.000
རྣག་འདྲ་བ། སྐྱེ་གནས།	0	-	0	-	-

*Multiple responses allowed

suggests an excess of heat in the body, which causes the body's fat to melt and appear as oil-like froth in the urine [14]. On the other hand, a lack of frothiness indicates a cold-related condition that reduces the body's inner heat, leading to froth-free urine[15].

Anecdotal evidence also suggests that the lack of frothiness in urine nowadays may be attributed to people consuming less oil in their diets. Tumours can also be diagnosed through the observation of urine frothiness. If cracks are seen within the froth, it may indicate the presence of a tumour. Additionally, a tumour can be suspected if small, fish-eye-like bubbles are observed in the middle of the urine specimen [16].

In *Sowa Rigpa*, patients are advised to follow specific dietary and behavioural restrictions the day before providing a urine sample. This may be a potential influence on the content of the urine specimen and its properties. Further chemical analysis of the impact of dietary and behavioural restrictions on urine specimens is recommended to be studied.

This study is the first of its kind conducted in the country. This study standardizes the use of BASUP chart 2021 in the assessment of colour or urine specimens. However, the primary limitation of the study is all the nine parameters of the urine characteristics in the physiological stage could not be compared in an artificially heated stage. Future studies may be done in larger sample sizes with additional assessment of physicochemical characteristics to further substantiate these findings.

CONCLUSION

Urine characteristics of colour, odour, steam, bubbles, sediment, and frothiness were consistent between urine samples in the physiological state and those subjected to artificial heating. However, there were differences in colour of དྭམར་ཤས་ཆེ་བ། (*Marshechewa*) and ཞེར་ཤས་ཆེ་བ། (*Sershechewa*) in the two methods of analyses. Future studies in larger sample sizes and detailed physicochemical characterization of urine specimens are recommended.

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Declarations

Ethics approval and consent to participate.

Ethics approval for the study was obtained from Research Ethical Board of Health, Ministry of Health, Royal Government of Bhutan (REBH/approval/2020/10053). Administrative clearance was obtained from the Policy and Planning Division, Ministry of Health and from the respective Medical Superintendents of the hospitals. Informed consent was taken from the study participants prior to specimen collection.

Consent for publication

Not applicable

Competing interests

KU, TG, S Tenzin and KT are members of the editorial board of this journal. They were blinded during the peer review process of this article.

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Availability of data materials

The dataset is available from the corresponding author upon reasonable request.

Author contributions

Conceptualization, Methodology, Formal analysis, Investigation, Resource: ND, DW, S Thinley, TG, S Tenzin, KT

Writing - Original Draft, Writing - Review & Editing: KU, TG

Formal analysis, Investigation, Data Curation: DW, S Tenzin

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3 རྡེན་འབྲེལ་དབང་འདུས། སངས་རྒྱས་དབང་འདུས། གསོ་རིག་འགྲུལ་གྲུབས་ཀྱི་ཁྲིག་འཕྲིང་ཨཱ་རོ། ཐོན་རིམ་དང་པ། རྒྱལ་ཡོངས་ནང་པའི་གསོ་རིག་དཔལ་ཁང་། ནང་པའི་གསོ་རིག་འཛིན་སྐྱོང་ཞུ་གཏ། ཐིམ་ཕུག། ༢༠༠ཀ།

4 རྒྱ་ཆོ་རིང། བཅག་ལ་རྩ་ཆུའི་རྒྱས་སྦྱོས་གོ་དོན་རེག་ཟབ་ཕྱོད་ཡིད་ཀྱི་ཚེ་ལོང། ཚི་རིགས་དང་སྨན་ཁང། ༡૯૯૫།

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8 སྒྲིམ་པ་ཆོ་དབང་། སྒྲིམ་འགྲེལ། དེབ་རྩ་ པ། ཐོན་རིམ་གསུམ་པ། སྨན་ཐིམ་ཁང་། རྩ་རམ་མ་ལ། རྒྱ་གར།

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