



## Original Article

## Quality of Histological Samples Received in the Pathology Laboratories of the University Teaching Hospital and the Central Hospital of Yaounde

### *Qualité des Échantillons Histologiques Reçus dans les Laboratoires de Pathologie du Centre Hospitalier et Universitaire et de l'Hôpital Central de Yaoundé*

Nya Kemkeu Stéphane<sup>1</sup>, Buh Nkum Collins<sup>2</sup>, Nganwa Grace<sup>3</sup>, Beyala Bit'a Landry<sup>2</sup>, Ngo Pambe Rissia<sup>4</sup>, Nsangou Ahmed Moustapha<sup>5</sup>, Yonkeu Emmanuel<sup>1</sup>, Ateudjiu Jerome<sup>2,6,7</sup>, Nangue Charlette<sup>2,8,9</sup>

## Affiliations

- Higher Institute of Medical-Health and Biomedical Studies of the University Institute of the Tropics, Yaounde, Cameroon
- Department of Health Research, Meilleur Accès aux Soins de Santé (M.A. SANTE), Yaoundé, Cameroon
- Department of Biological Science, Faculty of Medicine and Pharmaceutical Sciences, University of Douala, Cameroon
- Yaoundé Central Hospital, Yaoundé, Cameroon
- Department of Microbiology, University of Selçuk, Selçuk, Turkey
- Department of Public Health, Faculty of Medicine and Pharmaceutical Sciences, University of Dschang, Dschang, Cameroon
- Division of Health Operations Research, Ministry of Public Health, Yaounde, Cameroon
- Anato-Cytopathology Laboratory, Centre Hospitalier Dominicain Saint Martin de Pores, Yaounde, Cameroon
- School of Health and Medical Sciences, Catholic University of Cameroon, Bamenda.

## Corresponding Author

Nangue Charlette,

E-mail : [nanguecharl@yahoo.fr](mailto:nanguecharl@yahoo.fr)

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## ABSTRACT

**Introduction.** Pathological diagnosis (PD) is of great importance for the optimal management of the patient. It is therefore imperative that the analyses of tissue sample comply with all relevant norms and standards. **Objective.** To identify Non-Conformities (NC) on histological samples received in Pathology Laboratories (PL). **Method.** A descriptive cross-sectional study was conducted at the PL of the University Teaching Hospital Yaounde (UTHY) and the Yaounde Central Hospital (YCH) from 05 March to 06 April 2018. Using a NC data collection sheet, NC were collected on all histological samples received, focusing on exam form, container, fixative and large samples specificities. Data collected were analysed using Microsoft Excel 2010 software, and proportions of different types of NC stated. **Results** We received 78 samples, including 8 large samples; 48 (61.54%) samples had at least one NC. These NC was found in 31 (39.74) exam forms, 10 (12.82) containers, 7 (10.45) fixatives and 7 (10.45) large samples. A total of 128 NCs were observed; Ninety-two (71.9%) NCs were related to the exam forms, 17 (12.28%) to the containers, 9 (7%) to the fixative and 10 (7.8%) specific to the large sample. Two (1.6%) NCs were considered major. **Conclusion:** samples received at the PL of UTHY and YCH have many NCs that could affect the quality of the PD. Improved pre-analysis performance is needed to enhance the quality of the PD through training of health personnels on proper handling of histologic samples in Cameroon.

## RÉSUMÉ

**Introduction.** Le diagnostic pathologique (DP) est d'une grande importance pour la prise en charge optimale du patient. Il est donc impératif que les analyses d'échantillons de tissus soient conformes à toutes les normes et standards pertinents. **Objectif.** Identifier les non-conformités (NC) sur les échantillons histologiques reçus dans les laboratoires de pathologie (PL). **Méthodologie.** Une étude transversale descriptive a été menée au laboratoire de Pathologie du Centre Hospitalier et Universitaire de Yaoundé (CHUY) et de l'Hôpital Central de Yaoundé (HCY) du 05 mars au 06 avril 2018. À l'aide d'une fiche de collecte de données NC, les NC ont été collectées sur tous les échantillons histologiques reçus, en se concentrant sur la forme de l'examen, le contenant, le fixateur et les spécificités des grands échantillons. Les données recueillies ont été analysées à l'aide du logiciel Microsoft Excel 2010, et les proportions des différents types de NC indiquées. **Résultats.** Nous avons reçu 78 échantillons, dont 8 échantillons de grande taille ; 48 (61,54%) échantillons présentaient au moins une NC. Ces NC ont été trouvées dans 31 (39,74) formulaires d'examen, 10 (12,82) conteneurs, 7 (10,45) fixateurs et 7 (10,45) grands échantillons. Au total, 128 NC ont été observées ; 92 (71,9 %) NC étaient liées aux formulaires d'examen, 17 (12,28 %) aux conteneurs, 9 (7 %) au fixateur et 10 (7,8 %) spécifiques au grand échantillon. Deux (1,6 %) NC ont été considérées comme majeures. **Conclusion :** les échantillons reçus au LP du CHUY et de l'HCY présentent de nombreuses NC susceptibles d'affecter la qualité du DP. Il est nécessaire d'améliorer les performances pré-analytiques afin d'améliorer la qualité du DP en formant le personnel de santé à la manipulation correcte des échantillons histologiques.

## INTRODUCTION

Pathological diagnosis (PD) is of great importance for the optimal management of patients. Consequently it is mandatory that the analyses of tissue samples complies with all relevant norms and standards (ISO, GCPL)[1]. Laboratory analyses are based on 3 main phases that are not dissociated, namely the pre-analytical phase, the analytical phase and the post-analytical phase. Any error during one of these phases can lead to an incomplete or incorrect diagnosis, or even to the absence of a diagnosis by rejecting the sample. Studies have shown that the pre-analytical phase is the one that contains the most diagnostic errors [2–6]. In histopathology, the pre-analytical phase ranges from the collection of samples to the preparation of slides that will be read under the microscope by the pathologist in order to establish a diagnosis. Till date, no published study on quality of histological samples in Anatomopathology Laboratories has been conducted in Cameroon. However, quality must be continuously improved in the laboratory; and for this purpose, an evaluation of the different tasks that contribute to the diagnosis must be done on a periodic basis. In order to contribute to the improvement of the quality of APD in Cameroon, we aimed to find NCs on samples arriving at the HCY and CHUY APLs.

## MATERIAL AND METHODS

### Study design

This was a descriptive cross-sectional study conducted in the APLs of CHUY and YCH from 05 March to 06 April 2018. All histological samples arriving at the 2 laboratories were observed and non-conformities recorded on a data collection sheet.

### Study site

The CHUY and HCY are part of the reference hospitals of Cameroon, classified as 2nd category hospitals. They are located in the city of Yaoundé, which is the economic capital of Cameroon, in the Center region. As such, many specialists work there. Each of these hospitals has an APL which receives an average of 40 histological samples per month from the different departments of these hospitals, other regional hospitals (2nd category), district hospitals and similar private hospitals in the Central region and neighbouring regions (4th category), district medical centres and similar private medical centres (5th category) in the Centre region and neighbouring regions.

### Sampling

An exhaustive sampling was performed during our study period where all histological specimens received in the 2 laboratories were included. A sample was considered as a single specimen and its examination forms.

### Description of the tool and variable

We designed sample non-conformity sheets which we used for data collection. These data were divided into 4 categories: exam form, the container, the fixative and the large specimens.

The parameters assessed on the exam form were

- Patient-related: full names, age, gender, telephone details and clinical information.
- Prescriber-related: full names, departments and contact details of the prescriber
- Related to the specimen: dates of collection, the nature of the specimen and the collection site.

We defined a large specimen as one that was 5 cm or larger. The particular criteria sought on large specimens were the opening of the specimen and its orientation. The opening of the intestinal specimens was in conformity when it was made on the antimesenteric side. The opening of other large specimens was conforming if it was done in deep but incomplete slices of less than 2 cm while preserving the morphology of the organ.

The quality of the fixative was assessed by observation and by smell. The fixative was considered non-conforming if one or more of the following observations were made:

Fixative of unknown nature :

- When the fixative of the specimen collected the same day did not have formalin odour,
- When the fixative of a specimen collected at least the day before remains red (blood-stained),
- When the specimen had a rotten smell.

Pure formalin: when the fixative was highly irritating to the eyes and respiratory tract when the container was opened.

The fixative was considered insufficient when:

- The specimen has adhered to the walls of the container.
- The specimen was not immersed in formalin.

The fixative was considered to conform when all the following conditions were met:

- When the container is opened, the fixative releases a formalin odour without irritating the eyes or respiratory tract.
- The specimen was completely immersed in the fixative and the specimen did not adhere to the container walls.

NCs have been classified as minor and major.

- We considered as minor non-conformity any non-conformity that could lead to an incomplete result, to a delay in diagnosis or to the prevention of a subsequent test such as immunohistochemistry. We considered as a major non-conformity any non-conformity that could lead to an inaccurate diagnosis or failure to diagnose (e.g. absence or unknown fixative, failure to open large specimens).

### Statistical analysis and ethical consideration

Data analysis was carried out using SPSS 7.2 software, which enabled us to highlight the proportions of NCs according to examination request form, container, fixative and large sample and classified by NC type. We obtained ethical approval from the HCY and CHUY prior to the study implementation.

## RESULTS

Seventy-eight specimens were received in the two APLs; 48/78 (61.54%) specimens had at least one NC, including

7 large specimens. NC related to exam form were the most represented category with 31 (39.74%) exam form NCs. A total of 128 NCs were recorded; the average NC per sample was 1.64. Ninety two (71.9%) NCs were related to exam form, 17 (12.28%) to containers, 09 (7%) to fixative and 10 (7.8%) specific to large specimens. Seventeen NCs were found on 10 containers. Four (23.53%) of these NCs were small containers and 4 (23.53%) were broken plastic bottles.

Nine NCs were observed on 07 samples of which 1 (11.11%) did not have fixative and 1 (11.11%) was a fixative of unknown nature (Table 1). 10 (7, 81%) NCs was observed on 7 out of the 8 large samples. They were 5 (50%) NC opening (50%) and 5 (50%) NC orientation.

**Table 1: Distribution of NCs according to Categories and related Type**

Categories of NCs	N	%
Exam form	31/78	39,74
Container-related	10/78	12,82
Fixative -related	7/78	8,97
Large samples-related	7/8	87,5%
<b>NC related Type (N=128)</b>		
Related to exam forms	92	71,87
Container-related	17	13,28
Fixative	9	7,00
Related to large sample	10	7,81
Total	128	100
<b>Related to exam forms(N=92)</b>		
Age	7	7,61%
Gender	13	14,13%
Patient information	22	23,91%
Prescriber's information	25	27,17%
Date of collection	10	10,86%
Clinical information	15	16,30%
Total	92	100%
<b>Types of NC related to containers(N=17)</b>		
Non-transparent	3	17,65
Cut plastic bottle	4	23,53
Breakable plastic bottles	2	11,76
Unstable base	1	5,88
Too small container	4	23,53
Narrow opening	3	17,65
Total	17	100
<b>fixative-related NC(N=9)</b>		
Fixative absent	1	11,11
Fixative of unknown nature	1	11,11
Pure formaldehyde	3	33,33
Insufficient fixative	4	44,44
Total	9	100%

## DISCUSSION

Seventy-eight samples were received in the two PLs; 48/78 (61.54%) samples had at least one NC (table1). Plebani and Carroro in 1996 and 2006 showed that respectively 68.2% and 61.9% of laboratory errors were due to pre-analytical causes [3,5]. A study conducted in Thailand showed that the pre-analytical phase is the source of 84.5% of diagnostic errors in the laboratory[4]. Our results can be explained by the fact that pathology remains a poorly known discipline among health personnel in Cameroun. Moreover, few health personnel

have been trained in the handling of histological sample. A total of 128 NCs were recorded; the average NC per sample was 1.64. NC related to exam form were the most represented; 31/78 exam forms (39.74%) had a total of 92/128 NCs (71.9%), A 2004 Thailand's study found that 14% exam forms were missing and 26.8% contained errors in patient identification[4]. The absence of inadequacy of health data is a major challenge for epidemiology of diseases in low-income countries [7]. Despite being a minor NC, the lack of data on exam form could interfere with the diagnosis and consequently with the therapy and survival of the patient. We found that, 10/78 containers (12, 82%) had a total of 17/128 NCs (12.28%) in contrast to a study reported in Thailand, where only 0.6% of non-conforming containers were observed[2]. In Cameroon, medical ward that send samples to PL do not have standardised containers for histological specimen. Samples are fixed in non-adequate containers provided by nurses or the family. Seven over 78 fixatives (87.5%) had a total of 09/128 NCs (7%), including 2 majors NC. Fixation is the most important step in the pre-analytical phase and the only definite and irreversible step in the Tissue Processing [8]. When the sample is received at the PL no later than 6 hours after collection, fixative-related NC can be easily corrected. However, in our context, some samples have been received several days after collection because the family lacks money or information of the need for the pathological examination, or lives in remote areas. The late arrival of the sample makes it difficult to correct them, thus, minor NCs can become major. Rao et al found that about 0.04%, 0.07% and 0.18% samples were not sent in fixatives in 2007, 2008 and 2009 respectively[6]. Seven over 8 larges samples had a total of 10/128 specific NCs (7.81) with similar causes and consequences as those of fixative related NC.

## CONCLUSION

Samples received at the PL of UTHY and YCH have many NCs that could affect the quality of the PD. There is a need of improvement of pre-analysis performance to enhance the quality of the PD through training of health personnel on proper handling of histologic samples in Cameroon.

## COMPETING INTERESTS

The authors declare no competing interests.

## AUTHORS' CONTRIBUTIONS

Nya Kemkeu Stéphane: protocol design, development of data collection tools, data collection, analysis and interpretation; writing and review of the manuscript.

Nganwa Grace: protocol design, development of data collection tools, supervision of data collection, writing and review of the manuscript.

Buh Nkum Collins: Data analysis, writing and review of the manuscript.

Beyala Bit'a Landry: Data analysis, writing and review of the manuscript

Ngo Pambe Rissia: writing and review of the manuscript

Nsangou Ahmed Moustapha: writing and review of the manuscript

Ateudjieu Jérôme: writing and review of the manuscript  
 Yonkeu Emmanuel: supervision of data collection, writing and review of the manuscript  
 Charlette Nangué: general supervision of the project, writing and review of the manuscript.

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#### REFERENCES

1. 14:00-17:00. ISO 15189:2012 [Internet]. ISO. 2021 [cited 2023 Mar 13]. Available from: <https://www.iso.org/fr/standard/56115.html>
2. Types and frequency of preanalytical mistakes in the first Thai ISO 9002:1994 certified clinical laboratory, a 6 – month monitoring | BMC Clinical Pathology | Full Text [Internet]. [cited 2023 Mar 13]. Available from: <https://bmcclinpathol.biomedcentral.com/articles/10.1186/1472-6890-1-5>
3. Carraro P, Plebani M. Errors in a Stat Laboratory: Types and Frequencies 10 Years Later. *Clinical Chemistry*. 2007 Jul 1;53(7):1338–42.
4. Hollensead SC, Lockwood WB, Elin RJ. Errors in pathology and laboratory medicine: Consequences and prevention. *Journal of Surgical Oncology*. 2004;88(3):161–81.
5. Plebani M, Carraro P. Mistakes in a stat laboratory: types and frequency. *Clin Chem*. 1997 Aug;43(8 Pt 1):1348–51.
6. Rao S. Quality Measures in Pre-Analytical Phase of Tissue Processing: Understanding Its Value in Histopathology. *JOURNAL OF CLINICAL AND DIAGNOSTIC RESEARCH* [Internet]. 2016 [cited 2023 Mar 13]; Available from: [http://www.jcdr.net/article\\_fulltext.asp?issn=0973-709x&year=2016&volume=10&issue=1&page=EC07&issn=0973-709x&id=7087](http://www.jcdr.net/article_fulltext.asp?issn=0973-709x&year=2016&volume=10&issue=1&page=EC07&issn=0973-709x&id=7087)
7. Sung H, Ferlay J, Siegel RL, Laversanne M, Soerjomataram I, Jemal A, et al. Global Cancer Statistics 2020: GLOBOCAN Estimates of Incidence and Mortality Worldwide for 36 Cancers in 185 Countries. *CA: A Cancer Journal for Clinicians*. 2021;71(3):209–49.
8. Guide sur l'assurance qualité en anatomopathologie - Phases pré-analytique et analytique – Comité consultatif en anatomopathologie.